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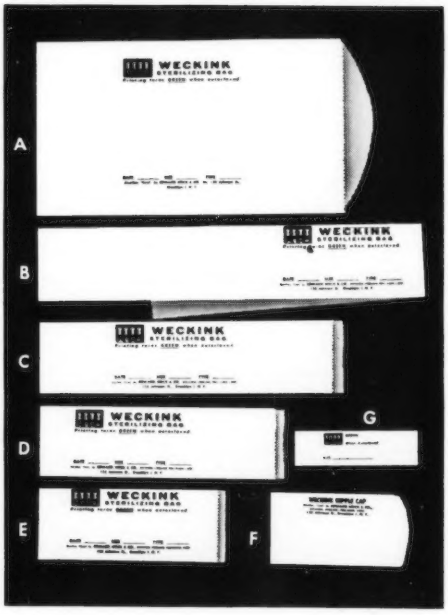

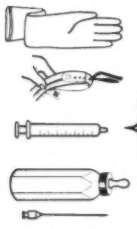

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Foreword . . .

This book contains a series of select articles on central supply planning and operation. In going through these articles, think of them as specific aspects of central supply, prepared either as guides for planning and operation or to illustrate the author's experience in this field.

The rapid growth and acceptance of central supply as an important department in efficient hospital operation makes this book a valuable addition to hospital literature.

As you review the articles in this book, it is hoped that you will find not only the solutions to your central supply problems, but that you will obtain ideas for improving the efficiency of your central supply, thereby also improving patient care in your hospital.

Margaret K. Schafer
Chief Nurse, Health Office,
Federal Civil Defense Administration
Battle Creek, Michigan

☆ ☆ ☆ ☆

Publisher's Note

HOSPITAL TOPICS in 1952 became the first hospital publication to recognize the importance of the central supply department by establishing a special section in the magazine for its personnel.

From the articles which have appeared in that section, the editors have carefully selected the ones which appear in this year-book the first of a series.

The assistance of Margaret K. Schafer, R.N., and Dorothy W. Errera, R.N., in reviewing the volume is gratefully acknowledged.

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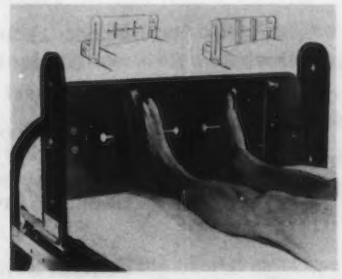

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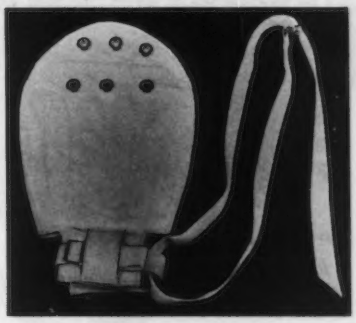

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Table of Contents

The Administrator Evaluates Central Supply 3
Norman D. Bailey

Function, not Beauty, Important in Central Supply Room Design..... 4
Frederick Marcus

What Is Wrong With Conventional Central Service Planning? 5
Frederick Marcus and Mrs. Jean Christie, R.N.

Basic Central Service Planning..... 9
Frederick Marcus and Mrs. Jean Christie, R.N.

Storage in Central Supply..... 12
Frederick Marcus and Mrs. Jean Christie, R.N.

Linen in Central Service..... 16
Frederick Marcus and Mrs. Jean Christie, R.N.

Syringe Processing..... 19
Frederick Marcus and Mrs. Jean Christie, R.N.

Needle Processing..... 23
Frederick Marcus and Mrs. Jean Christie, R.N.

Glove Processing..... 27
Frederick Marcus and Mrs. Jean Christie, R.N.

Model CSR Floor Plans..... 30
Frederick Marcus and Mrs. Jean Christie, R.N.

We Made Our Own Glove Powdering Device 37
R. D. Manning and Pauline Wilson, R.N.

Department Functions Smoothly Under System of Direct Responsibility to administration 38
Ruth E. Pendleton, R.N.

Central Supply Service Discussed at New England Meeting..... 41
Sister M. Annunciata, Mary E. Brackett, R.N., Ruth L. Rochford, R.N., and Mathew J. Ustas, R.N.

In-Service Program Aids CSR Efficiency..... 44
Elizabeth Ouderkirk, R.N.

Installing a Central Supply Control System... 47
Mathew J. Ustas, R.N.

Planning a Central Supply..... 51
Louise H. Streb

How Central Supply Functions at Denver General 52
Carol Larson, R.N.

Work Simplification Applied to the Hospital.. 56
Karl Linderoth

Work Simplification in Central Supply Service 59
Edna A. Prickett, R.N.

Pre-Packaging 65
Wayne Comer

Severe Dermatitis Is Eliminated by Complete Removal of Residual Drugs from Syringes 67

Alert Supervisor Improves Her Department.. 69

Issuing Thermometers from Central Supply.. 71
Bob Byrne

Sterilization of Supplies—Part I: Sterilization by Chemicals..... 72
Velma L. Chandler, Ph. D.

Sterilization of Supplies Part II: Problem-Solving Clinic..... 74
Velma L. Chandler, Ph.D., P. L. Engler, Helen Horvat, R.N., and J. N. Masci

Aseptic Technic in Central Supply..... 81
Mildred Dodge, R.N.

Notes on the Characteristics, Composition and Care of Rubber Materials Used in Medical Goods 82
R. Douglas Sanders, M.D., and James P. Aikins, M.D.

Flask Technic for Sterile Surgical Fluids—Guide to Planning..... 83
Margaret K. Schafer, R.N.

C. S. at Cook County Hospital a Major Operation 85

Gadgets Improve Efficiency of CSR at Mt. Sinai 88

Central Supply Economy and Efficiency..... 90
Margaret K. Schafer, R.N.

Standardization and the CS Supervisor..... 94
Betsey R. Carroll, R.N.

Standardization in the Central Supply Department—an Outline Guide for Planning.... 95
Margaret K. Schafer, R.N.

A Guide to Central Supply Literature..... 96

Supplement No. I 101

Supplement No. II 102

Index 107

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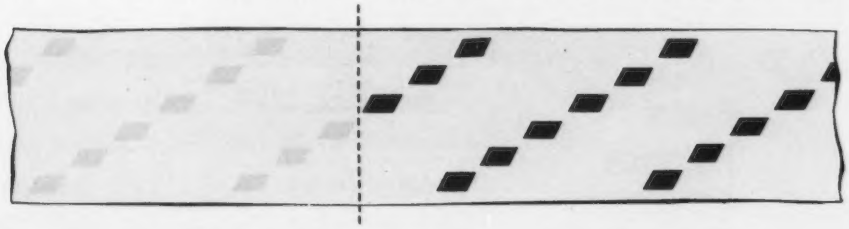

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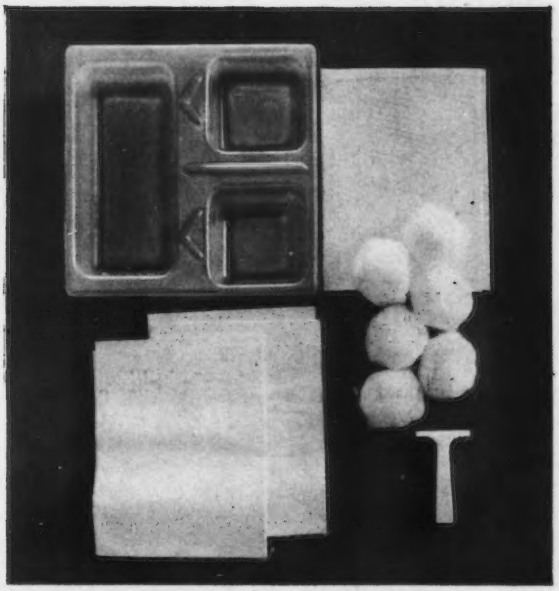

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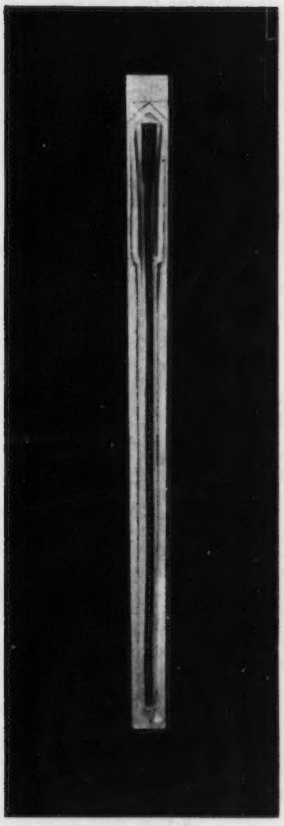

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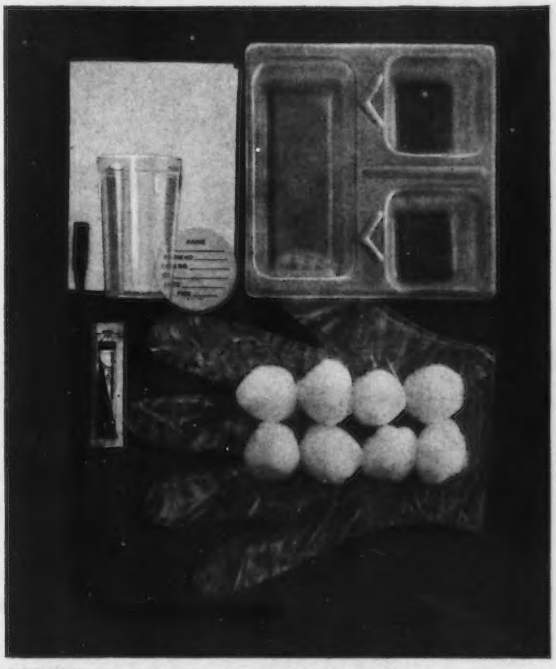

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The Administrator Evaluates Central Supply

By Norman D. Bailey*

EXPERIENCE in a hospital which for several years has maintained an efficient and well-organized central supply service, preceded by experience in hospitals in which central supply service was either extremely limited or nonexistent, provides a fair basis for evaluation of the effectiveness and desirability of such a program.

In a large degree the weight of the evidence is in favor of a central supply service. This favorable balance could be upset, however, if certain basic and essential conditions should be lacking. As one of America's largest industries, hospitals must, of course, stand committed to efficient and sound business operation. It is even more important that their procedure contribute to the improvement of patient care.

From the administrative point of view, any planned coordination of effort that (a) increases productivity; (b) provides for better utilization of manpower; (c) leads toward more economical operation; (d) decreases time lapse between need and availability, and (e) develops better understanding of responsibilities, should lead to better patient care.

A well-planned central supply unit increases productivity. Through elimination of duplication, it is possible to operate with fewer units of each instrument or other needed items, yet, because of this reduction, to provide for a more widespread selection at no increase in cost.

A well-organized central supply unit lends itself to optimum utilization of personnel. Such utilization is attained when each employee finds himself occupied to the full extent in that work for which he is best trained and for which he has the most aptitude.

Too often in our modern hospitals we are forced to employ a skilled individual for some particular task, only to find that he can be utilized at his highest skill for only a small portion of working time, while the balance of his time is spent in working at some lesser skill for which less money might have been paid. Opportunity is afforded in a centralized plan to train this employee to do specific tasks and to perform them with sufficient frequency to acquire skill and relatively high productivity.

Experience has taught us that only when a task is performed with sufficient frequency is that task performed economically from the standpoint of method, time, or material. Such a possibility is less apt to be present when the decentralized program is in operation.

For each position in the central supply unit, position specifications and procedure sheets can be developed. Through these, better selection and recruitment of employees can be carried on by the personnel department. Savings in the number of employees may make available money which can be utilized to increase the pay schedule and make recruitment more selective.

Such possible savings may not be apparent at first, since the employees who formerly performed the tasks will still be on the payroll and will be needed to perform the balance of their individual work schedules. As the program is developed and each individual job of which the content has been changed is restudied, new assignments of tasks will remedy the situation, and the savings will become apparent.

Increased definitiveness of task — spelling out responsibilities of the individual employee—makes supervision easier and helps for clearer understanding between supervisor and employee.

Whereas in a decentralized unit a supply nurse may be required in each area, the centralized plan should make it possible to employ skilled nurse supervision and a balance of nonprofessional-level-employees. This will produce savings and may lead to better job satisfaction on the part of the employee group.

Very important in the picture is the unit supervisor who becomes a specialist in her area of work. She is available for consultation with members of the medical staff, of whose special interests and needs she has become cognizant. She should meet with whatever committee of the medical staff is concerned with medical supplies and equipment. She should become so skilled in her field that she provides basic assistance to administration in interpreting the needs of various situations involving instruments, equipment, and service.

—QUANTITY PRODUCTION; STANDARDIZATION OF EQUIPMENT

It is an axiom of administration that an increase in the quantity of production should mean lowered cost, improved service, and increased efficiency. The cost of basic equipment is reduced to a minimum through elimination of duplication of equipment. In a decentralized program the necessity for availability of items which might just as easily be placed in a central supply unit means purchase and maintenance of several units of the same item.

Through the medical staff's therapeutic or surgical committee, agreement can be reached as to desirable standards for each unit handled by the central supply service. Here again the special training of the supervisor becomes significant. The contents of the various packs can be determined.

Since these packs or units are all set up under standard directions and trained supervision, the possibility of misinterpretation of directions and of substitutions of other than specified items is reduced to a minimum.

—ECONOMY OF OPERATION

Economies through increased productivity and through better utilization of personnel can lead to savings or to possible increase in the money available for equipment. Another outgrowth of a good central supply program should be the increase in the variety of equipment which can be justified. Money saved may well be used for this purpose.

—SUMMARY

Administrators may well view a centralized supply service as a basic factor in a smooth-running hospital. Regular reports as to its services should be made to the director of nursing and the administrator. With such reports at hand, the administrator is able to back the department and explain problems brought to him. If personnel are well chosen, he can feel a sense of certainty that the department is administered in the interests of the best possible care of patients.

*Executive Director, Grant Hospital, Chicago

Function, not Beauty, Important in Central Supply Room Design

By Frederick E. Markus*

● The design of central supply rooms has of late received considerable attention as a hospital area in which industrial methods of production and assembly can be employed advantageously. Despite this, many poor layouts result. This can be traced to the use of a few superficial concepts of what makes for efficient production.

Chief among these is the so-called "straight line flow" concept, based on the assumption that, ideally, supplies and materials are received at one end of an elongated area and a finished product is delivered at the opposite end. Even in industry, this simple concept does not always apply. The main line of flow can take the form of a loop and be just as efficient as a straight line. On somewhat the same premise, the work is assumed to move through a series of rooms along an assumed line of flow.

While flow as such is still an important aspect of any good planning, in any CSR the proper interrelationship of work stations is a much more important item. Consider first that there will be substantially more work stations than workers. In planning, these stations should be precisely spotted, allowing the proper work area and facilities for each. They should be arranged for sitting if possible, or alternate sitting and standing, or just standing—whatever best meets the work conditions and the workers' comfort. Provisions should be made for knee space and foot rests for those sitting and using high stools.

Of these stations, few will be full-time for any particular job. Therefore, the work station must be designed for dual use, or the worker must be able to circulate between respective stations without too great a loss in time. For example: Receiving is a work station, issuing is another. To put them at opposite ends of a long room, remote from any other work station, rises a question of who will man them. Both are bound to call for intermittent service. Actually, the two activities are generally better if adjacent and centrally located. Even then the combination may still not be a full-time job for anyone, but being nearer to other work stations it can more readily be combined with a third job.

This brings to light a second important aspect of CSR planning. Because of the short runs and the variety of work to be performed, the supervisor, who will most often perform a certain amount of production work, must be so located that from her own activities she can oversee her entire domain. Departmentalizing by means of room partitions or even alcoves is, for most operations, not warranted. Any process which is out of sight increases the task of supervision.

This problem was well illustrated in a visit to a new CSR of a large hospital. The supervisor was much distressed, actually frustrated by the difficulty of operating her department. As she put it, "Everything is in exactly the wrong place." It was also assumed that everybody would work standing. This is hardly humane. Stools were provided, but there was no knee space at any of the stainless steel work benches. So a sort of side-saddle posture was the only alternative.

With everything built in and the dominant materials ceramic tile and stainless steel, built to last forever, the prospects for altering this condition are remote.

A supervisor who is stuck with one of these rigid and inflexible departments has, unfortunately, little chance of ever getting corrections made. If there is excess open floor space, supplementary tables might be a partial solution. These can be arranged to suit job-to-job requirements.

For those who are interested in producing the utmost in efficiency, proper planning may be considered about half the battle. Substantial additional gains in efficient operation are possible by a study of methods and work measurement. From a pilot study just completed it is evident there remains much that can be done. Chiefly (although we admit we are oversimplifying somewhat), consider the following three questions with respect to each job:

1. How should this specific job be done?
2. Who should do it?
3. How long should this doing take?

Simple as these questions are, they are difficult for the untrained to answer. Yet answers are possible, and they are loaded with surprises.

The value of the answers, if they were known, is obvious. By simply adding up to the total for No. 3 and dividing by eight (hours in a working day) the number of employees to run the department would be precisely known, after the usual allowance for personnel and breakdown time was made.

Few realize the potential economies in this field. Let us review one typical example—which turned out to be only a five-hour job instead of the eight-hour job it was previously assumed to be. No one had even suspected this.

Moreover, when an improved method was developed which eliminated much wasted motions, the job was reduced to three hours daily. Over and above this gain was the fact that the comfort of the worker was improved and interest in work improvement aroused in the department as a whole.

Unfortunately, supervisors are not equipped by training to make such studies. But just knowing and believing that few jobs as such could survive an analytic challenge without having their time cut substantially should sharpen a supervisor's scrutiny.

---

*Mr. Markus, of the firm of Markus & Nocka, architects and engineers, Boston, has done extensive studies in work simplification and time and motion.

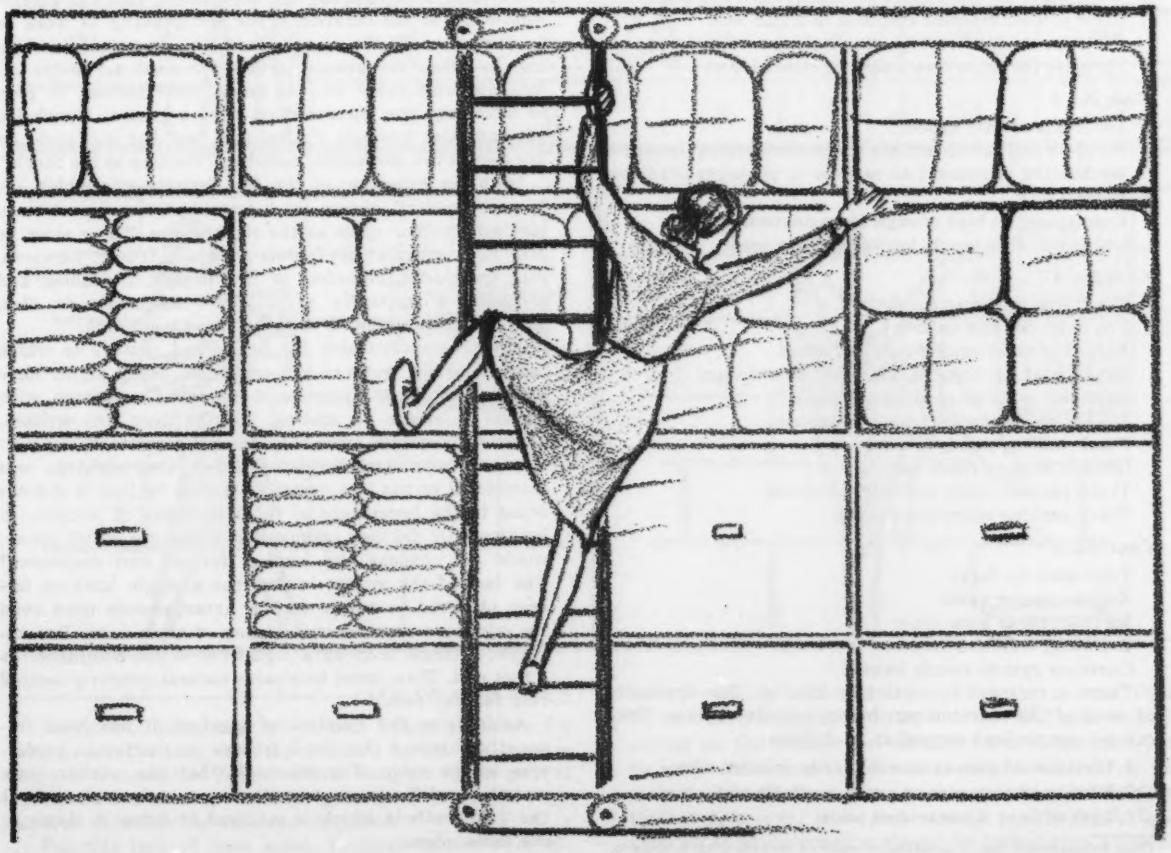
What is Wrong with Conventional Central Service Planning?

By Frederick E. Markus, Markus & Nocka, Boston, Mass.,
in collaboration with
Mrs. Jean Christie, R.N., Free Hospital for Women, Brookline, Mass.

● No department in a hospital adapts itself so readily to the use of industrial production methods as does central service. Yet nowhere will there be found any production or service department in any industry which in its planning might serve as a pattern for the conventional central service planning in hospitals. By repetition, conventional central service planning has fallen into one general pattern, and the pattern is one which obviously requires the least thought on the part of the planner and yet produces the greatest frustration to a conscientious central service supervisor.

Consider for a moment the role of the planner of a typical central service department. Both the general plan and such details as appear necessary will in all probability be part of the assignment of a draftsman, who has not the slightest idea what actually takes place in central service. His usual approach is to copy or adapt a previous example to the available space. This practice accounts in large part for the obvious similarities found.

The draftsman can count on some help from manufacturers' representatives, and there may be a few suggestions from the hospital administration itself. The person who is finally responsible for the plan and its production facilities will rarely see the department in operation. He will never know whether it worked—well—badly—or not at all.



Consider by contrast the planning of any department in industry. The planner must account for every last detail by collaborating with a group of specialists. The final product must represent the last word in production flow, methods timing, and tooling. It will be based on precise time and methods studies, flow analysis, and work place layouts. New concepts will be pretested with mockups and full-size working models. The job is not considered finished until it is operating smoothly and every last "bug" is ironed out. It will definitely not be a one-man job.

COMMON SHORTCOMINGS

A careful examination of some recently completed central service departments will illustrate the many shortcomings, which actually become monotonous by repetition. Here are a few of the most obvious shortcomings:

Case No. 1

Sterile supplies at opposite end of department from issuing window
Excess counter space
No general storage area for supplies
No knee space anywhere for seated operators
Poor sterilizer arrangement which produces constant arm burns during unloading*
Too much empty floor space
Office remote from everything
Dumb waiter remote from sterile storage.

Case No. 2

Allocated area inadequate
Two Dutch doors poorly located and neither used
No space for linen storage
No tables available nor space for linen folding
No knee space at any of the work counters
No space or service outlets for mechanized equipment
Glove powder machine standing in traffic lane
Partition subdivision with door which serves no purpose
No space for supervisor's desk or clerical work.

Case No. 3

Too much counter space
No space and service outlets for mechanized equipment
Mechanized equipment at random in passages unrelated to normal flow
Knee space not high enough to accommodate knees
One Dutch door poorly located and not used.

Case No. 4

Total area inadequate
Too much counter space
Receiving and cleaning very restricted
Single washing sinks, making rinsing awkward
Assembly work place areas too small
Mechanized equipment not anticipated
Dumb waiters poorly located
General storage space lacking
Truck passage space severely restricted
Truck parking space inadequate.

Case No. 5

Total area too large
Excess counter space
No foot rest at knee space
Too many individual rooms
Conveyor system poorly located

There is no point in continuing the list. The similarity of most of the shortcomings becomes quite obvious. They can be summarized somewhat as follows:

1. Dictation of plan by an arbitrarily selected area
2. Placing of a counter on every available wall
3. Lack of knee space or foot rests
4. Failure to include mechanized equipment in the original planning
5. Lack of empty floor space where required.

To this list should be added some less obvious items:

1. The fallacy of permanence at the price of flexibility
2. Lack of correctly designed work place layouts
3. Improper use of stainless steel.

*This arrangement was so installed in spite of manufacturer's protests.

EXPENSE NO CRITERION

The inadequacies of central service cannot necessarily be laid to limited budgets. The poorest plan observed contained the most expensive materials and the best equipment, a great expanse of terrazzo floor, wall tiled from floor to ceiling, no end of stainless steel counters (without a single knee hole), with almost everything in the wrong order, yet practically unchangeable, and, of course, so permanent that it could last a thousand years. Unfortunately, it was obsolete before it was finished.

The average central service supervisor, in taking over a new department, is almost immediately conscious of these shortcomings, yet can do very little about it. To complain when the pride of open house inspection is still glowing would be considered the height of disloyalty and ingratitude.

In almost every case a superior layout would have actually cost less, to say nothing of the saving in labor over the years, resulting from increased efficiency.

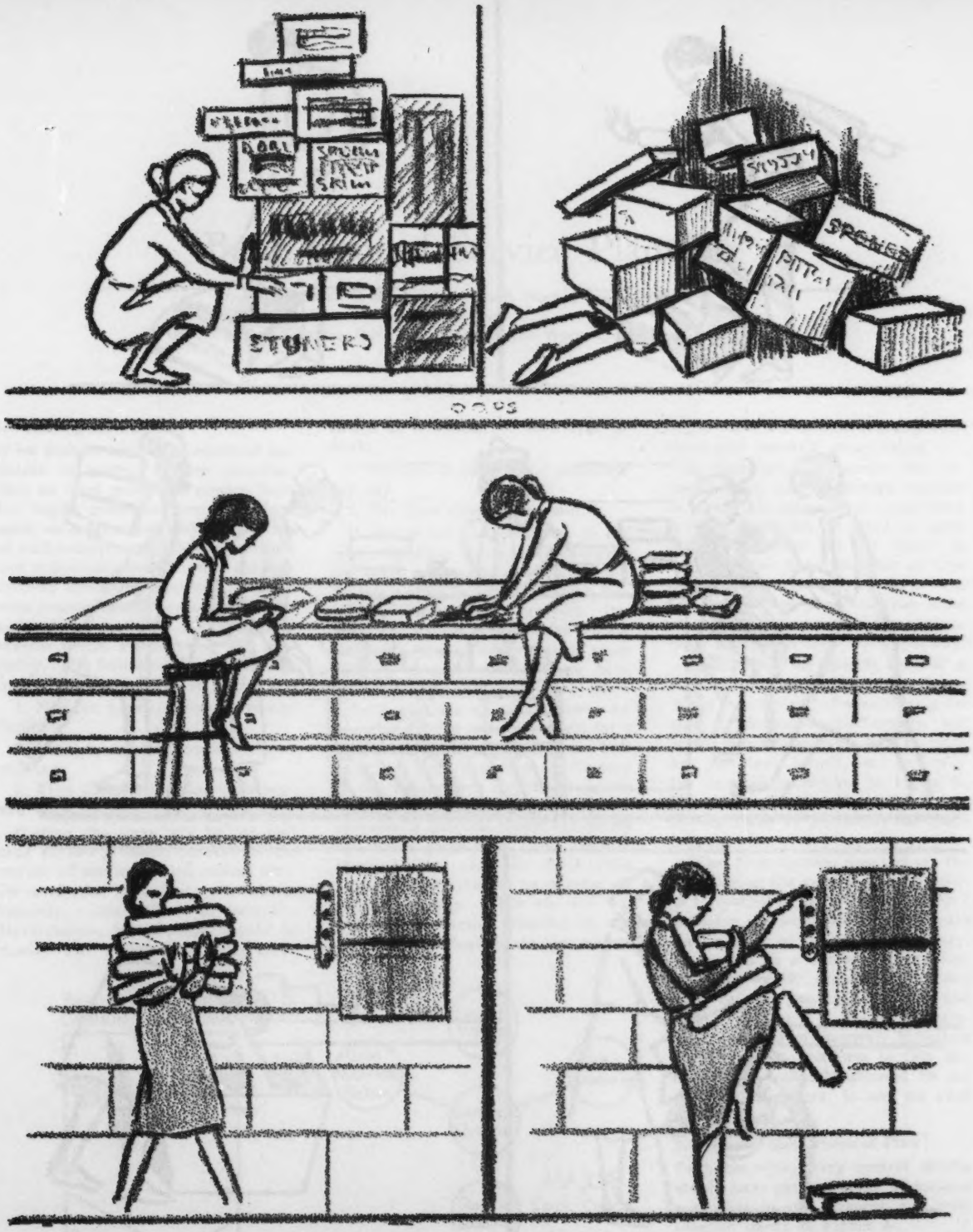
As a first step toward improvement, permanence should be discarded and the industrial theory of expendability substituted. Work stations should be for specific work type items and should be made as inexpensive and changeable as possible. In other words, a central service department should anticipate change in its original concept.

Planning a central service department requires precise knowledge of the different types and quantity of work to be performed. If the planner lacks this knowledge (which can be taken for granted), then he must certainly collaborate with those who do know. Nevertheless, to plan to advantage the planner must have a general knowledge of production methods, timing, and flow, but still count on the help of the specialists, including "the man at the bench."

With the exception of the few departments which are large beyond all reason, most central service departments lack empty floor space at the right places. There must be free floor space at the points at which trucks, hampers, etc., are loaded, unloaded, or just parked. If loading and unloading block traffic, as they now frequently do, then they interfere seriously with proper functioning.

A most unpardonable sin is the bad posture to which central service workers are subjected. Many states have laws concerning the posture of industrial employees, with special reference to seating. As the laws are written, however, hospitals, since they are not mentioned, are outside the laws' jurisdiction. Whether this omission was intentional or not is a question. It may be that it did not occur to the lawmakers to think in terms of workers in hospitals. Or did they assume that a hospital, of all places, would not condone bad posture for its own employees? The fact of the matter is that not a single instance has been observed in which seating arrangements meet even the minimum requirements of any of these laws. For example, a single hoop on a high stool is not acceptable as a foot rest. There must be a more natural, properly located rest for the feet.

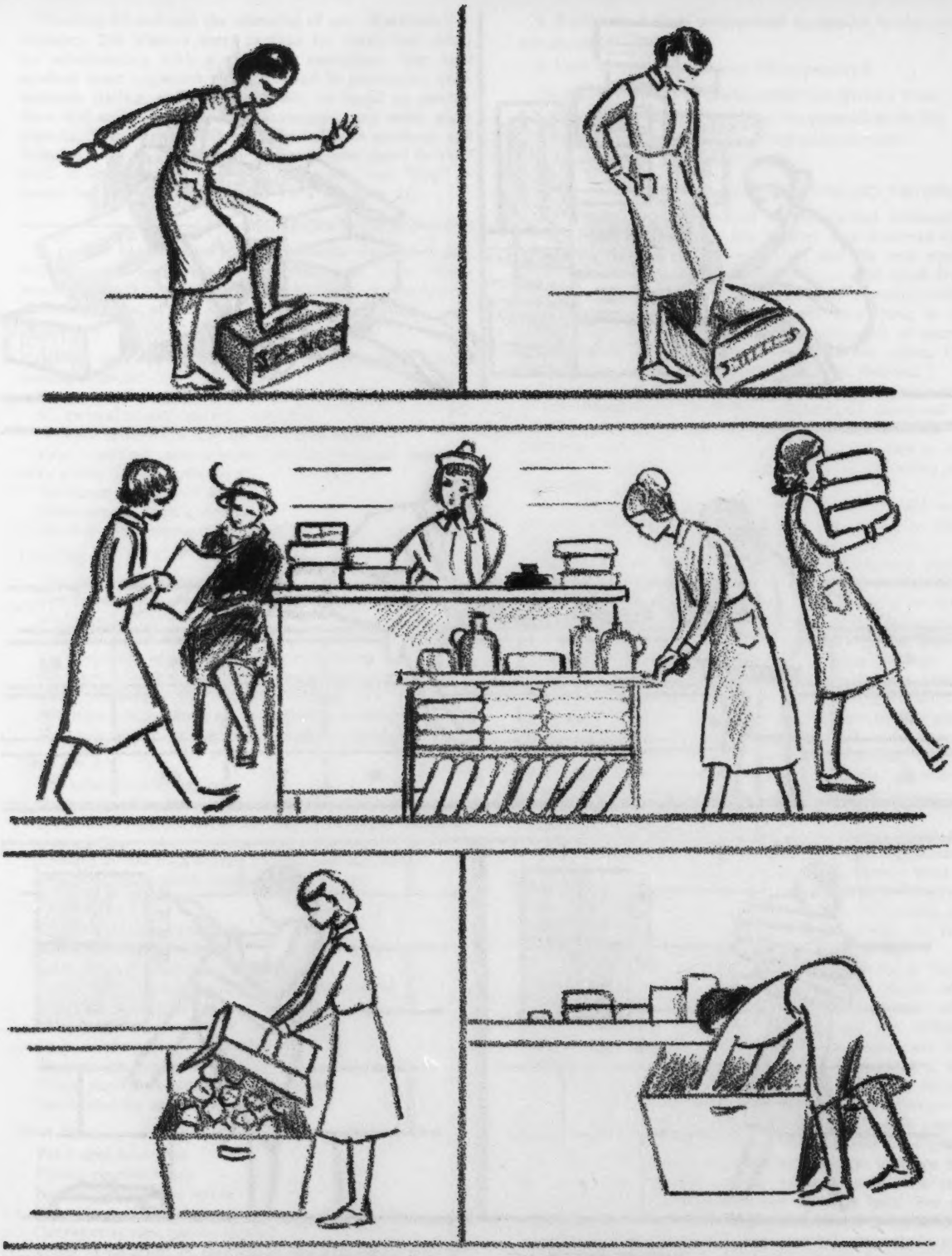
Aside from the question of comfort, it has been frequently observed that work is done on the lap in preference to the table. The reason is that the worker, once seated, has difficulty in repositioning a high stool, without the firm foothold which is required to bring it closer to the table edge.



LACK OF KNEE SPACE

To provide knee holes which lack height clearance for the knees (because of deep drawers under the counter top) is inexcusable. Every normal designer has a pair of knees he can measure without getting up from his chair and so establish the required clearance.

For this lack of knee space, employees have been observed working while leaning against the counter (that is, with their backs toward the counter) and also actually sitting on the counter for certain work. Employees who do work which requires close inspection are forced to use a shelf under their counter as a hassock on which to place their feet, in order to be close enough to their work. Legs propped at an awkward angle can be looked upon as tragic



or comical, depending on one's point of view.

The use of stainless steel throughout central service is open to considerable criticism. It causes a major cleaning problem because it finger-marks and spots so easily, and leaves stubborn black streaks on white shoes. Also, annoying glare may be caused by light reflection from this shining surface. Some workers use sheets of some pliable material to cover their work area, to prevent this glare and the extra cleaning—hurriedly removing these covers, of course, when inspection is about to occur. More thought should be given to the choice of surface materials used in specific locations.

Basic Central Service Planning

By Frederick E. Markus, Markus & Nocka, Boston, Mass.,
in collaboration with
Mrs. Jean Christie, R.N., Free Hospital for Women, Brookline, Mass.

1. Getting the Facts

If we wish to apply the industrial approach to central service planning, then we must substitute precise facts for vague generalizations. Furthermore, we must cease thinking in terms of wall counters and tables at random and substitute specific work stations in their optimum sequences. Tied in with processing will be storage centers and storage facilities, all tailored to specific needs, yet allowing for flexibility. The following must be established before planning can begin:

1. Number, type and size of storage facilities

2. Number, size and layout of work stations

3. Flow pattern adjusted to storage and work stations.

Getting the facts will be the real crux of the problem, because of the variety of services which central service performs. The facts are, unfortunately, rather difficult to ascertain. Nevertheless, the attempt should be made. The following information should be available for each type of work:

1. Number of units to be processed per day

2. Net time element per unit.

It should not be too difficult to determine within a reasonable degree the volume of work to be processed. To this should be added a safety factor plus something to grow on. Determining the time element for processing each type of work is much more difficult when no studies have been made routinely for some time past.

Let's consider an actual case. An operator did the required output for a certain item in eight hours. This length of time appeared satisfactory to the supervisor. A time study revealed that the job as done by the operator in question should not exceed five hours gross time. The operator then admitted that she did a little stretching to make the work come out to an even day. When the job was analyzed for motion economy by way of work simplification, the new method which became available required only three and one-half gross hours.

If, therefore, the person who requests basic data for design purpose is given this information (supposing it were available), it could be more than 100 percent off. It would be equally unfair to assume that all time elements can arbitrarily be cut in half, for it has been observed that some central service operators are surprisingly efficient in their work specialty.

Or consider the specific case of a manually operated machine. It is found that because of questionable design it functions indifferently and breaks down frequently. The machine has just been bought, and naturally the hospital is inclined to retain it. Yet its actual output per unit of time is only about 30 percent of the rated output.

What time element does one use for establishing the number of such units or the output to meet the day's needs? Industry, obviously, would not tolerate such a piece of equipment. Industry, to survive in a competitive market, must constantly scrutinize the balance between methods, output, and time. To them it is one of the principal elements of survival. Hospitals do not have to conform to this discipline. To suddenly attempt its acquisition, therefore, is not an easy matter.

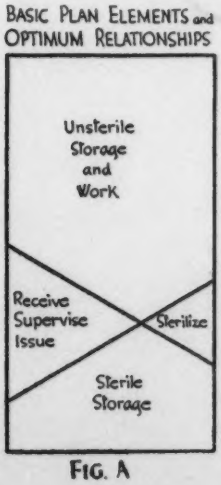


FIG. A

FIG. B

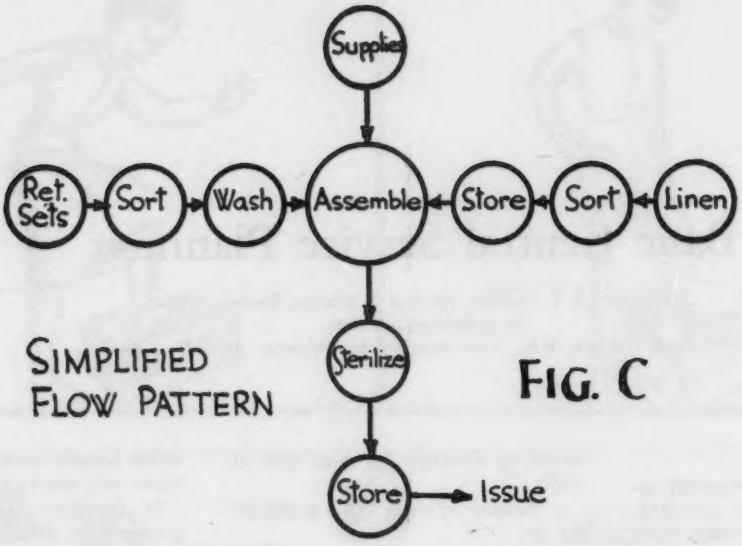
2. General Subdivision of Plan

To begin with, every central service should have general space allocations somewhat in the sequence and relationship shown in Figure A.

3. Open Floor Space

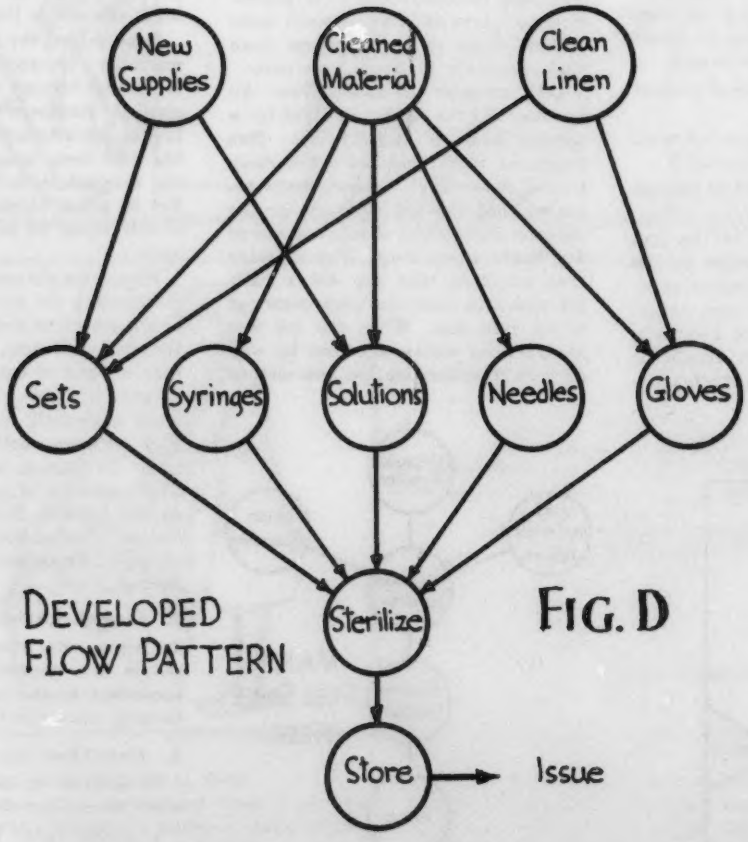
In addition to flow, we must consider three types of open space for:

1. Traffic lanes (which should always be free and clear)



SIMPLIFIED FLOW PATTERN

FIG. C



DEVELOPED FLOW PATTERN

FIG. D

2. Temporary storage (truck parking—unpacking supplies—empty cartons)

3. Loading and unloading areas (receiving—loading—unloading)

The required spaces are best illustrated by Figure B, in which the lines represent connecting traffic.

The ultimate plan may enable certain areas to coincide. In addition, space must be provided for containers for soiled linen, waste paper, broken glass, etc.

4.—Basic Flow

At the initial stage of planning it is well to think of flow in the simplest possible terms. Consider, therefore, Figure C. Essentially returned goods, new stock, and clean linen are combined and sterilized for issuing.

Having fixed in mind the basic flow pattern, look now at a more detailed aspect of this flow—Figure D. There are a large number of annoying crossovers which must be accounted for. From this we can see immediately that our end result, at best, will have imperfections from the point of view of perfect flow. This is, therefore, something which we must accept. The problem will be to minimize these crossovers.

5. Flexibility

Because of the variability of work and the many short runs and because change in volume must be anticipated, there should be more work stations than contemplated operators. If reasonably precise facts become available, the number of stations required will show automatically in computing work stations' requirements. Over and above that, some percentage should be agreed upon for expansion of services. While this amount is arbitrary, 20 percent should be a minimum in any case.

6. Expendability

It has long been standard practice to use only the most durable materials for central service facilities. Industry does not operate on such a basis. Everything is considered expendable, including the building. For such items as sinks, drainboards, etc., the choice at the moment is limited to stainless steel. Other items should be progressively of less expensive materials, depending on use and the probable useful life. It must be remembered that most items of equipment become obsolete long before they wear out. Performance discourages change, whereas change should be encouraged.

By the same token, work stations should not be part of an endless built-in counter but separate entities that can be altered, detached, or replaced individually with ease, as conditions require. In addition, all floors should be finished wall to wall, so that curbs and other built-in items can be removed at any time without involving expensive floor patching.

7. Operator Comfort

Finally, there is the question of operator comfort, which involves the following considerations:

1. Posture
2. Floor resilience
3. Color schemes
4. Temperature
5. Humidity
6. Lockers
7. Toilets
8. Drinking water

The proper consideration of comfort requirements would hardly appear to warrant comment, except that unfortunately they are all too frequently overlooked or ignored.

On the question of posture for operators, there are three options:

First choice—alternate or optional sitting and standing

Second choice—sitting only

Third choice—standing only

On the basis of studies made by various authorities, there is no question that alternate sitting and standing is less fatiguing than continuous sitting or standing. It rests certain muscles, improves circulation, and has been made a legal requirement for industry in certain states. In our work we designate the assumed posture for each work station on plan by one of the three following symbols:

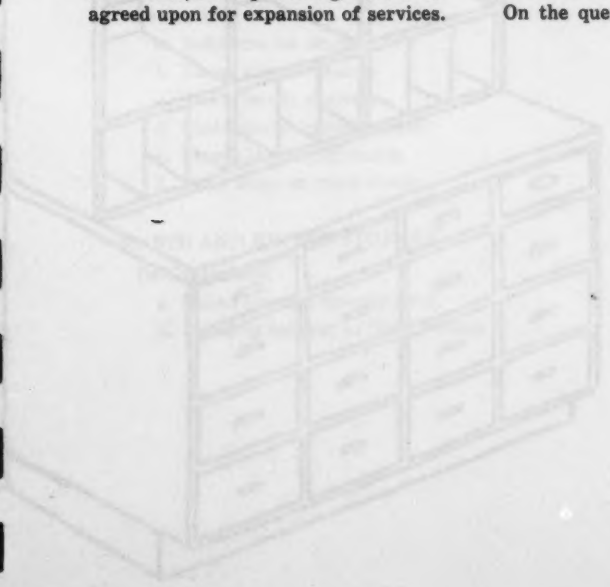
—optional sitting or standing

—sitting only

—standing only

It is obviously not practical to provide optional sitting or standing at all work stations. Furthermore, for the general run of work in central service, sitting on a standard height chair generally gives enough change of posture to overcome fatigue. It might be felt that the simplest procedure is to provide all work stations wherever possible with high stools, to allow optional sitting or standing. It is a fact, however, that the high stool is more difficult to manage than a standard height chair, and when frequent getting up is involved, positioning is a problem.

Finally, it is felt that chairs for work in central service should be on a par in comfort to those customarily furnished for clerical workers—namely, upholstered and with back rests.



Storage in Central Service

By Frederick E. Markus, Markus & Nocka, Boston, Mass.,
in collaboration with
Mrs. Jean Christie, R.N., Free Hospital for Women, Brookline, Mass.

When storage in relation to efficient production is given due consideration, the problem is more of a challenge than **might be supposed. If we follow the well-established industrial concept, central service storage will fall into three (3) distinct parts: (1) centralized supplies at a special storage area; (2) decentralized storage at points of use, and (3) transport storage. Efficient production is definitely contingent upon a well-planned storage and distribution system.**

Following are the principal items to consider for central service storage:

UNSTERILE SUPPLY STORAGE

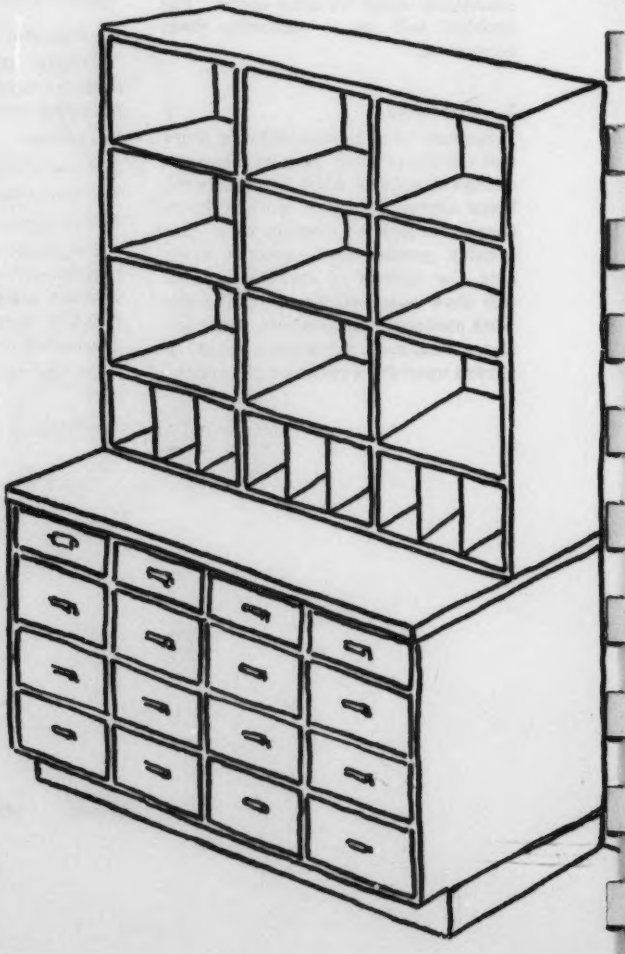
Centralized

a. Bulk supplies in cartons
b. Broken supplies on shelves
c. Security items in locked cupboard
d. Clean linen at linen center on shelves

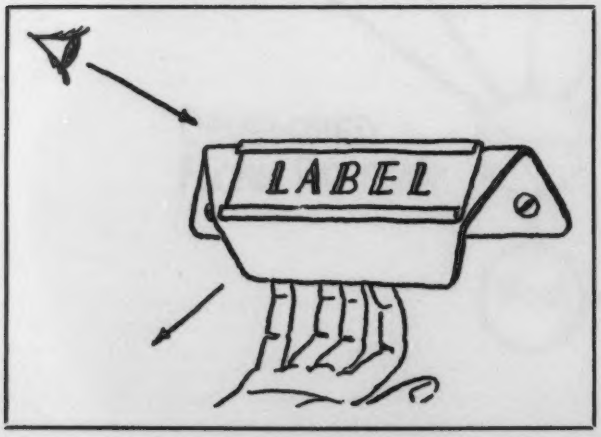
De-Centralized

a. Needles at needle assembly
b. Linen at set and kit assembly stations
c. Gloves at glove processing station
d. Soaps, solvents, and detergents at wash station
e. Solution ingredients at solution area
f. Small parts in portable tray units.

Right: Cupboard like this, with drawers and compartments, provides good storage for small sets, catheters, gloves, other items.



Below: Combination drawer handles and label holders on the cupboard reduce hunting time.



Above: For bulk storage, build a ledge under your supply shelves.

Above: For small items, store one item deep on narrow shelves.

STERILE STORAGE

Centralized

a. Solutions on shelves
b. Large kits on shelves
c. Small sets in drawers
d. Catheters in compartments
e. Gloves in compartments
f. Daily issue on ward trucks

WASTE AND REJECT STORAGE

De-Centralized

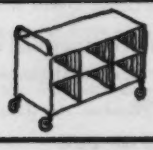
a. Soiled linen at cleanup area
b. Mending hamper at linen folding
c. Broken glass at cleanup and solution areas
d. Waste paper at several places
e. Empty cartons

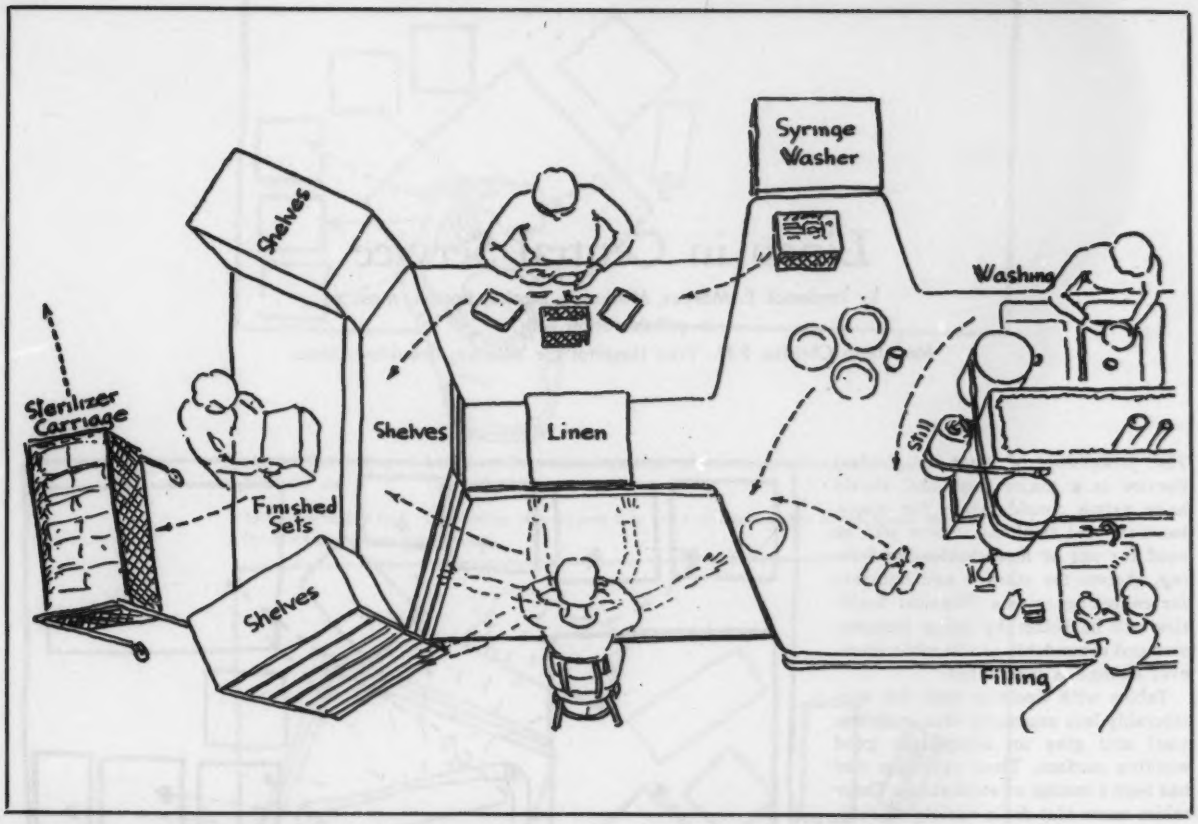
TOOLS AT POINTS OF USE
(Prepositioned where possible)

AT WORK STATIONS

a. Asbestos gloves
b. Shears
c. Tape dispensers
d. String dispensers
e. Instruction books
f. Brushes on-hooks
g. Drying cloths on bars

SIZE OF PERTINENT STORAGE ITEMS

ITEM		SIZE IN INCHES		
		WIDTH	LENGTH	HEIGHT
	CARTONS	SMALL 12	SMALL 18	SMALL 7
		LARGE 17	LARGE 24	LARGE 33
	GLOVE POWDER	10	10	12
	SOLUTION INGREDIENTS	SMALL 13	SMALL 13	SMALL 20
		LARGE 16	LARGE 16	LARGE 21
	RECEIVING TRUCK	24	40	36
	UTILITY CART	18	30	32
	STERILIZER CARRIAGE	SMALL 16	SMALL 56	SMALL 34
		LARGE 27	LARGE 93	LARGE 50
	WARD TRUCKS	SMALL 18	SMALL 32	SMALL 34
		LARGE 21	LARGE 36	LARGE 59
	LINEN DOLLIES	30	41	35
	LINEN HAMPERS	SMALL 20½	SMALL 20½	SMALL 36
		LARGE 26	LARGE 26	LARGE 37
	LARGE KITS	15	12	18
	WASTE CANS	SMALL 12	SMALL 12	SMALL 15
		LARGE 17	LARGE 17	LARGE 24



Above: Here is a work place layout designed for efficient storage and good work flow. Notice how the items come in, beginning with washing and following through to the shelves where finished sets are placed, ready to be picked up and placed in sterilizer carriages.

CENTRAL SUPPLY

h. Typewriter
i. Adding machine

TRUCK STORAGE ADJACENT TO PLACE OF USE ON FLOOR

a. Linen dollies
b. Ward delivery truck
c. Utility carts
d. Sterilizer carriages

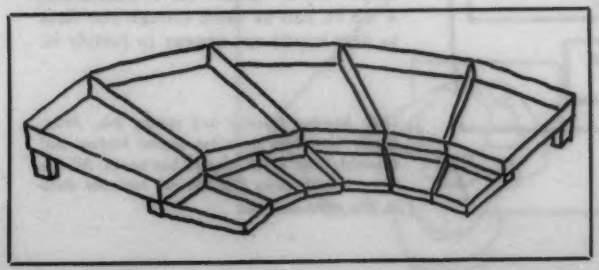
It may seem trivial to worry about such seemingly minor items as waste receptacles, linen hampers, etc. When, however, they are forever underfoot for want of space at the right place, it is certain that there has been lack of planning. Efficient processing involves more than an indication of flow arrows on plan running nicely from one end of the department to the other. The plan should definitely account for all major storage items, even though they are not a part of the building project.

It should also leave room for a reasonable degree of flexibility, so that the supervisor can modify storage to suit changing needs. She will want to consider security and ease of inventory control. A supervisor may prefer to store certain items in whole or in part, directly at their place of use—for example, gloves at the glove area, solutions at the solution area, etc. With this method the person working on that item can keep an eye on the supply on hand. If, on the other hand, the volume carried is too large for this arrangement, the item then can be issued as needed or split on some basis.

Storage beyond normal reach should be discouraged. Shelving should be either expendable wood or demountable metal. In all cases the shelves should be adjustable. The shelf edges should be arranged for holding labels of legible size. Drawers should run on roller extension slides and also have provisions for legible-size labels. By legible size we mean something that can be read at a reasonable distance. In other words, larger than typing.

An up-to-date central service department would be air-conditioned, circulating filtered air which is practically dust-free. Under such conditions door protection for general storage is not needed. This not only saves their cost but the time consumed in their endless opening and closing.

Below: Here is a tray unit for small parts assembly. It greatly simplifies assembly and reduces working time.



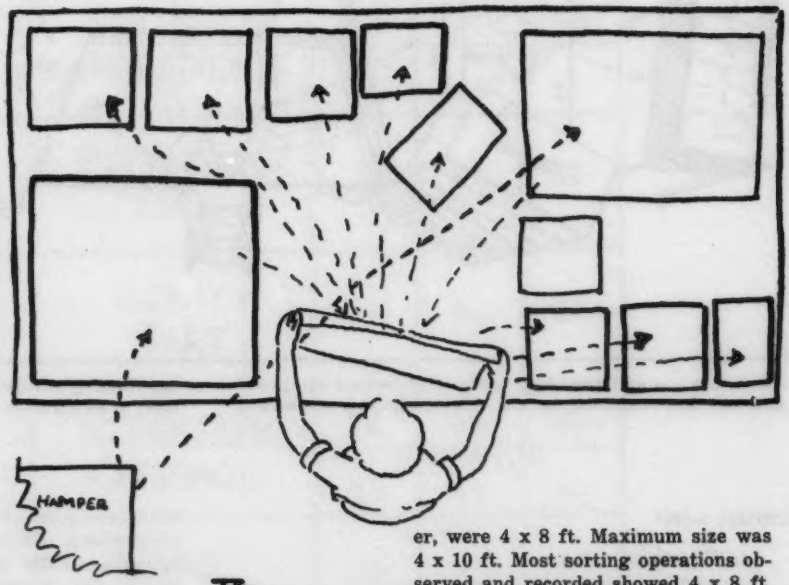
Linen in Central Service

By Frederick E. Markus, Markus & Nocka, Boston, Mass.,
in collaboration with
Mrs. Jean Christie, R.N., Free Hospital for Women, Brookline, Mass.

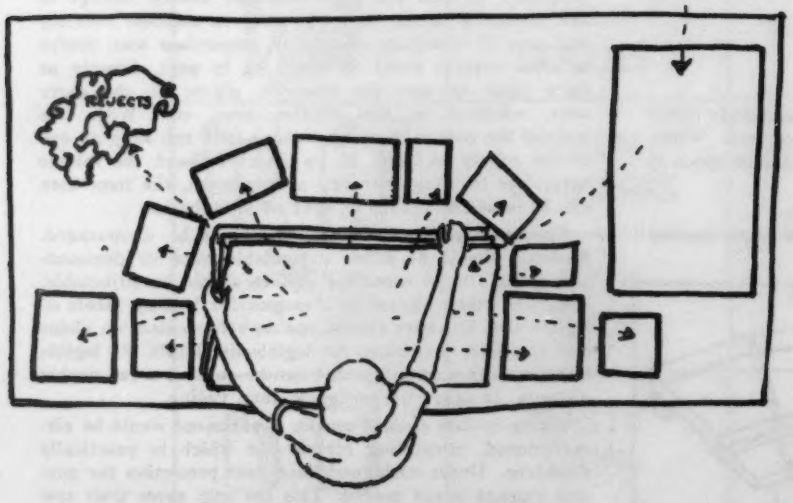
The processing of linen in Central Service is a major item and should have prime consideration for space, location, and facilities. There will be need for one or more tables for folding, shelves for storage and hampers for collecting rejects. Physical facilities will be better by being inexpensive and expendable or alterable whenever change is warranted.

Tables with linoleum tops are considerably less expensive than stainless steel and give an adequately good working surface. Their optimum size has been a matter of some study. These tables serve also for a variety of folding and assembly jobs that require relatively little space. Therefore the table should be no larger than necessary.

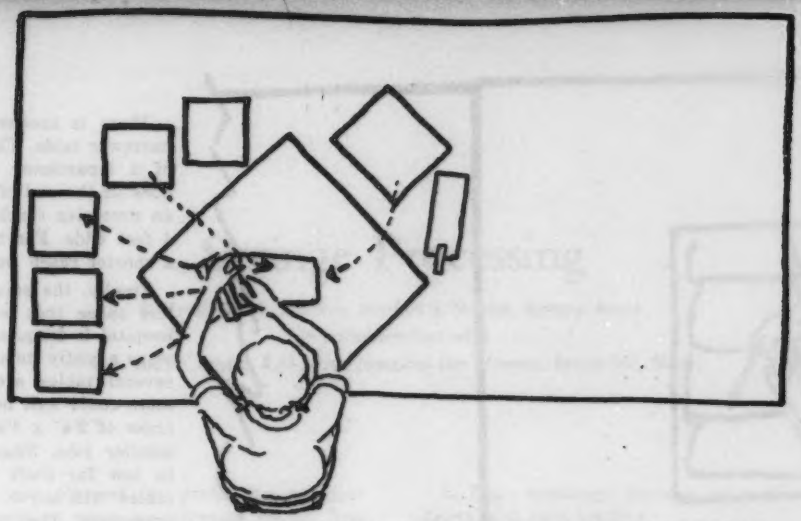
Tables found in use varied considerably in size. Most common, however, were 4 x 8 ft. Maximum size was 4 x 10 ft. Most sorting operations observed and recorded showed 4 x 8 ft. table tops fully used. On the other hand all sorting jobs could be done on a smaller top if the linen was transferred from the receiving hampers to transfer carts, instead of directly to the table and the sorting done from the carts as an adjunct to the table. Motion-wise this is somewhat more efficient when items are stacked both near and far from the hampers. The smallest usable table would appear to be about 3 x 5 ft. One such table might suffice to serve a fifty bed hospital. As requirements increase, a size of about 3'6" x 6'6" might serve better. As a maximum, 4 x 8 ft. can be used, though our data to date would not appear to justify it.



Right: Linen folding. Transferring from hamper to table followed by sorting, inspection and folding. A smaller top could suffice here, especially if linen were transferred to a cart and wheeled to a good pick-up position.

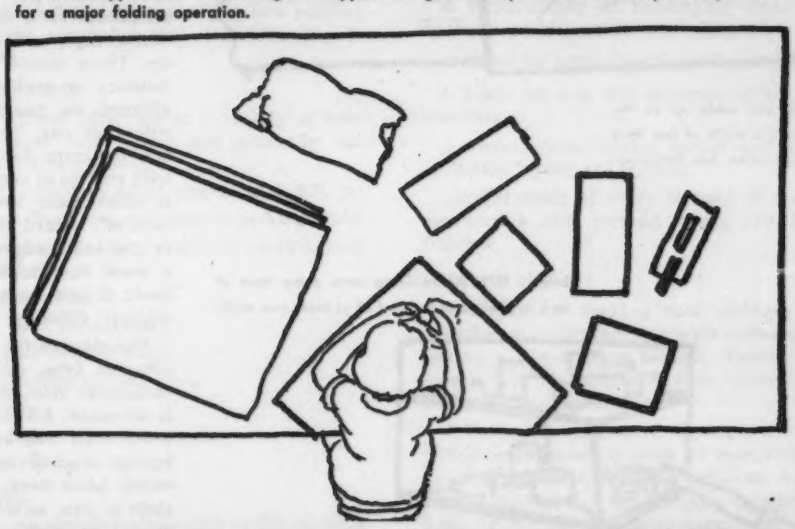


Left: Another transfer and sorting job. Afterwards the tables serve for special folding and assembly jobs which require less space. All are not primarily linen jobs but are logically done in this area.

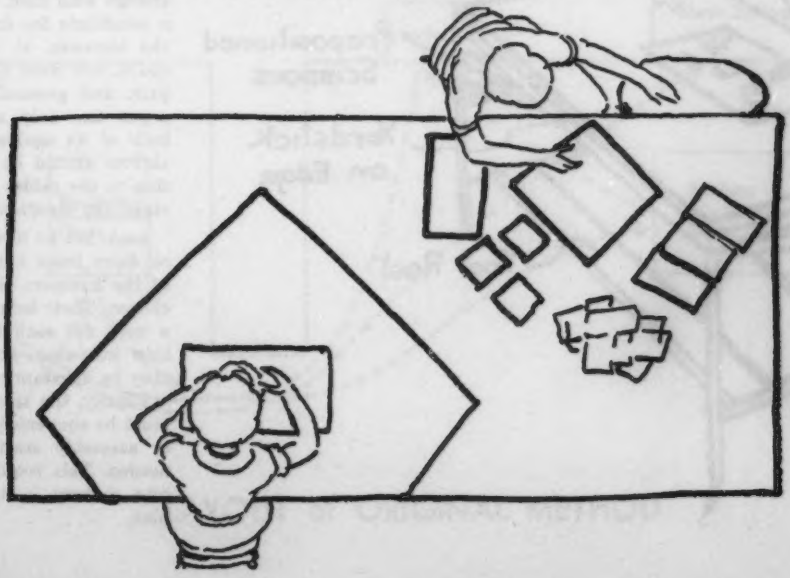


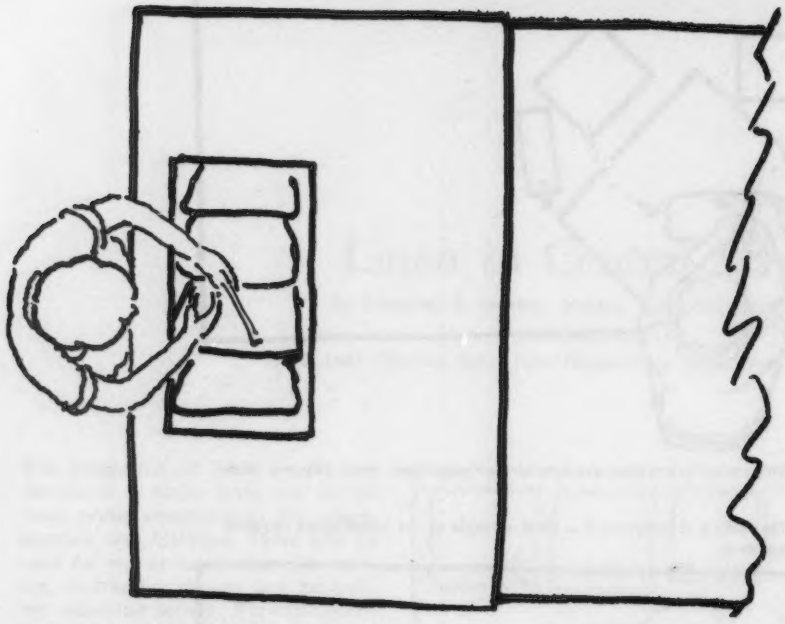
Above: The folding of half sheets is a typical example of the lesser table space required from this point on.

Below: Wrapper fold. The folding of wrappers is a good example of the actual space required for a major folding operation.



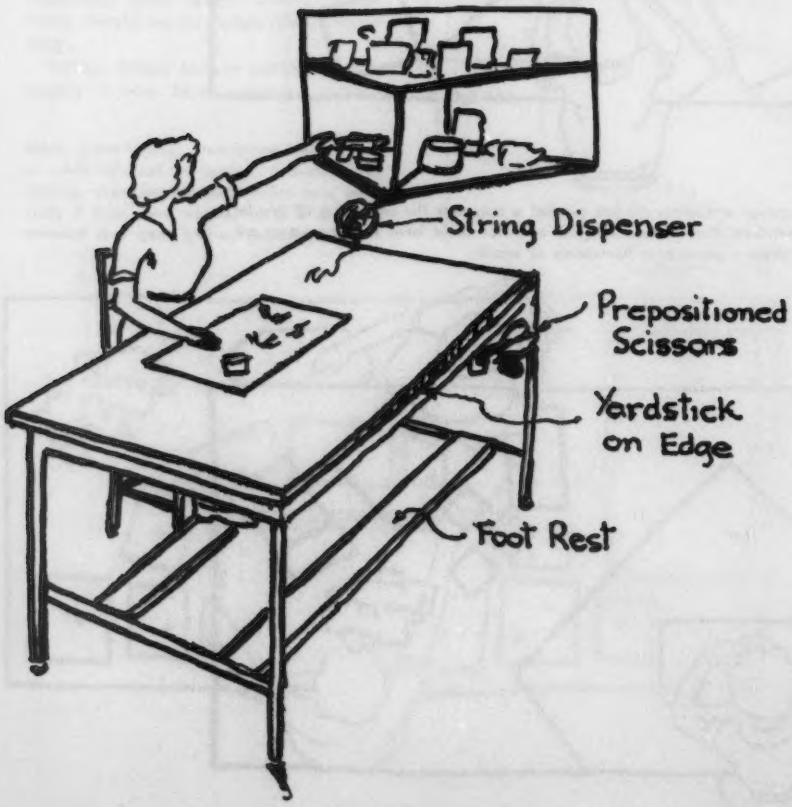
Below: Girl on right is sponge wrapping; she has pinched a bag over the edge of a tilt bin for support. In folding laparotomy sheets, below left, the operator could have used an empty adjacent table, but wisely chose a place near her source of supply.





Above: Laparotomy kits are made up on the end of a table. However, a width of less than four feet makes the operation less fatiguing.

Below: It is desirable to have some form of rack or shelves at the end of at least one table.



There is another point favoring a narrower table. The folding operation of a laparotomy kit, which is best done at the end of the table, involves an excessive reach when the table is 4 feet wide. For the average worker a shorter reach would be better.

Finally, the smaller the tables the less space they require; space in a hospital is frequently critical and always a costly item. In addition, where several tables are required, one or more could well be something on the order of 2'4" x 3'4" and used for the smaller jobs. Small linen tables can be low for chair sitting, the larger tables will serve best for standing operations. They should, however, be equipped with foot rests for stool sitting.

Some linen processing requires miscellaneous aids, such as scissors, adhesive tape, string, marking pencils, etc. These should not be relegated to drawers or cupboards but be prepositioned as nearby as possible at points of use. This may necessitate one or more tables being equipped with shelves or racks. Where roll stock is occasionally required to be measured off, a yard stick can be fastened to the table edge. The advantage of a wood base table will now be evident; it can be altered or added to without difficulty by shop personnel.

The storage for linen can be of the simplest type, either of pine or demountable steel. A shelf depth of 18" is adequate. All or part of the base or lower shelf may be set aside for storing in original cartons some of the bulky, basic items used with linen. If shelves are adjustable, which they should be, such arrangements can be made at any time. The amount of shelving is a matter which may change with time. The use of paper as a substitute for linen or muslin is on the increase. It requires much less space, will need no laundering, no repair, and generally no folding. The paper has only about one-third the bulk of its equivalent in fabric. The shelves should be so located in relation to the tables that a minimum of steps are involved in servicing.

Last, but no less important, are one or more linen hampers. The location of the hampers should not be left to chance. Their location must not entail a walk for each deposit nor necessitate long-shot accuracy; nor should they be constantly under foot.

Finally, the space assigned to linen must be conveniently adjacent to other assembly stations where linen is needed. This requirement sets a definite pattern in the Central Service plan.

Syringe Processing

By Frederick E. Markus, Markus & Nocka, Boston, Mass.,
in collaboration with
Mrs. Jean Christie, R.N., Free Hospital for Women, Brookline, Mass.

● Before facilities are planned for processing syringes in a new central service room, an attempt should first be made to improve the method of doing the job where it is. It can then be further improved as an abstract procedure for the basis of a completely new plan.

From our observation of syringe processing in a number of hospitals, we have concluded that the following is fairly representative:

Assume 2,000 syringes daily.

1. Syringes are returned after use in a variety of containers, including paper bags. They are generally not soaked—some are not disassembled.

2. A typical wash procedure after arrival in C.S.R. is:

a. Carry syringes from clean-up area to racking table.

b. Place matched barrels and plungers in racks having correct size perforations.

c. Load washing machine

d. Wash (cycle up to 30 minutes)

e. Rinse in tap and distilled water

f. Carry rinsed baskets to work area

g. Unload syringes

h. Band each matched pair with elastic

i. Carry syringes to pack station

Major Disadvantages:

a. Unnecessarily long washing time—200 to 350 minutes total.

b. High breakage because of method of return from floors, and rack loading.

c. Rack storage problem caused by large number required to accommodate various sizes.

d. Impossibility of thoroughly cleaning syringes with interchangeable barrels and plungers.

e. Need for extra handling of syringes after cleaning.

f. Limit of only 200 syringes which can be washed at one time.

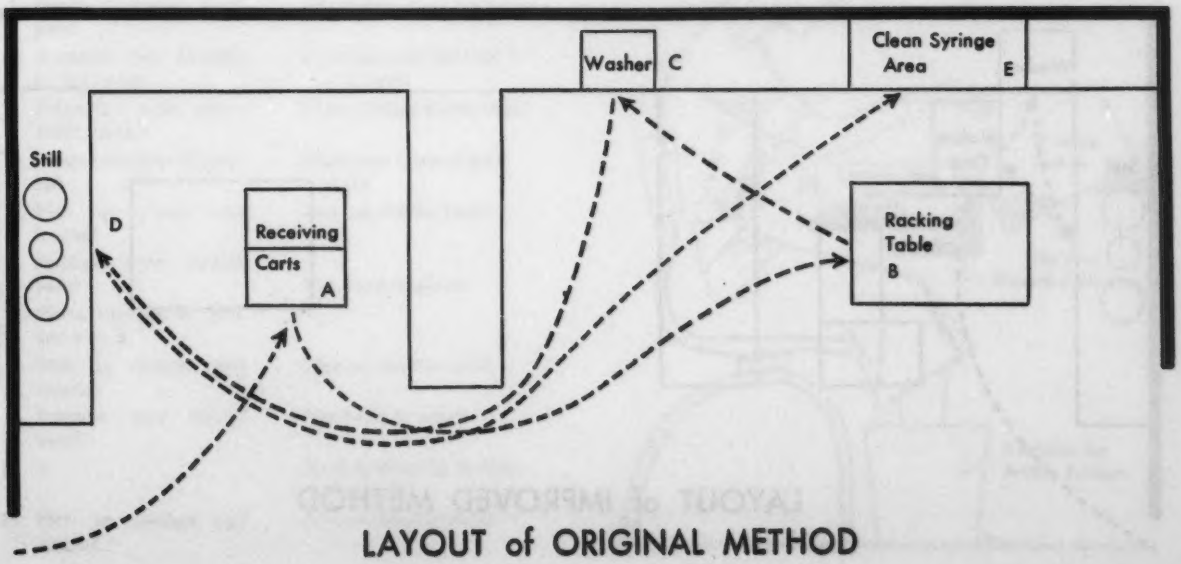
g. Considerable wasted motion and time resulting from inefficient layout and method.

Careful study of every element of a detailed flow chart produced a new method, which can be summarized as follows:

Improved Method:

1. A pan for soaking used syringes is issued to each department daily, together with sufficient detergent, establishing a pre-soaking technic. Twelve detergents of the proper type for glassware were tested in varying amounts for best cleaning results.

2. Racks are eliminated. Syringes are packed in baskets, in horizontal position, with all open ends facing the direction in which the machine revolves. Average size basket packed with just 5 cc. syringes, or with a combination of 2 cc., 10 cc., and insulin syringes, will contain about 1,300 syringes per basket.



LAYOUT of ORIGINAL METHOD

FLOW CHART

Syringe Washing

Original Method

1. Take syringes (two bags) from receiving carts to racking table
2. Place syringes from bags on table
3. Remove used elastic band from each syringe
4. Match numbers of each part
5. Place barrel and plunger of matched syringe in proper rack holes
6. Repeat process 199 times to fill four racks (50 syringes per rack)
7. Place four filled racks in four washing baskets
8. Carry each basket to machine and load (four trips over—three return)
9. Fill machine with detergent solution
10. Run first wash cycle
11. Drain and refill machine with detergent solution
12. Run second wash cycle
13. Drain and refill machine with fresh water
14. Run first rinse cycle
15. Open machine off and on to check fluid level
16. Remove baskets and carry to water still (four trips over—three return)
17. Give final rinse with distilled water to each basket
18. Carry baskets to clean syringe station (four trips over—three return)
19. Remove barrel and plunger of each syringe from rack
20. Match and inspect
21. Place new elastic band around each matched barrel and plunger
22. Repeat process 199 times, sorting sizes and types of syringes
23. Place each clean syringe in proper container
24. Cover all "clean containers"
25. Go to receiving cart for two more bags
26. Repeat entire process 12 times

SUMMARY: To Clean 2,600 syringes	Number
Operations	610 x 13=7,930 total
Storages, delays	52 total
Inspections	2 total
Transportation	299 total

CENTRAL SUPPLY

3. Washing cycle is cut to two minutes with ½ oz. detergent per wash water (average water capacity—16 gallons).

4. The two rinses are combined and lengthened to a minimum of 20 minutes. Rinse should be made with water in constant flow if type of machine permits (by simultaneous filling and draining of the machine). A distilled water rinse was found to be optional.

5. Equipment is rearranged for shortest route and most direct flow and new work stations planned in accordance with the changed methods.

No. 8 elastic bands were found to require the least motion and time in placement.

Major Advantages:

a. Very low breakage (0.5 percent)

b. Washing time for 2,000 syringes—100 minutes

c. No racks—no storage problem

d. Thorough cleanliness of all syringes

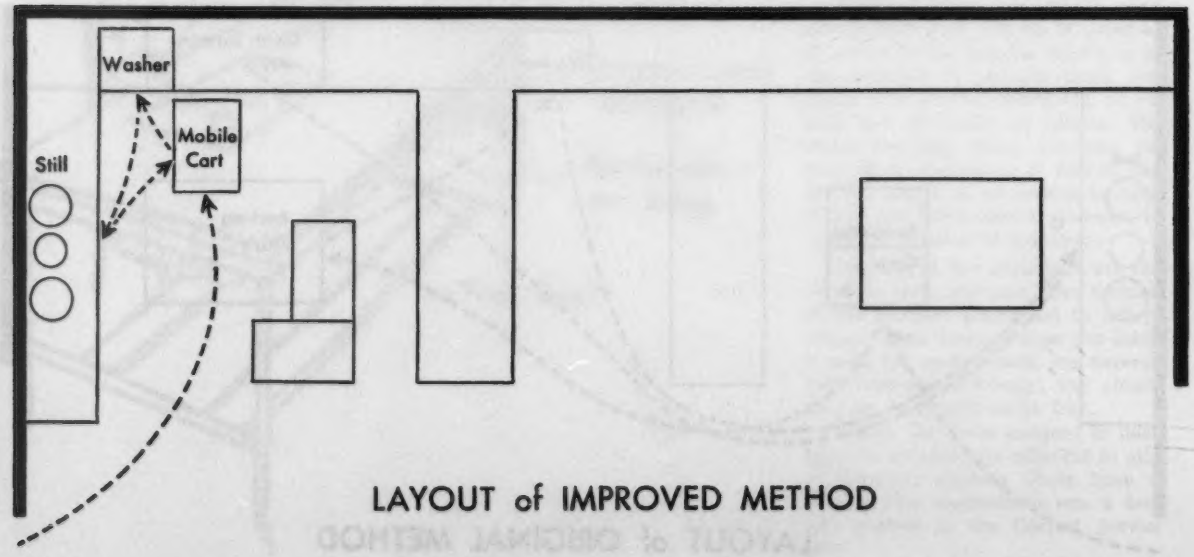
e. Placement of elastic bands around syringes before cleaning—not after.

f. Washing of all 2,000 syringes at one time made possible

g. Elimination of waste motion and improvement of quality

Production increase: 250 percent.

Making flow charts is a tedious job. Nevertheless, nothing to date has been devised which is as effective in ferreting out waste motion. Chart above and on next page show how improvements were made in one C.S.R.:



LAYOUT of IMPROVED METHOD

FLOW CHART

Syringe Washing

Improved Method

1. Place basins of pre-soaked syringes on mobile syringe cart
2. Remove elastic band from syringes, matching numbered parts
3. Place new elastic band around matched barrels and plungers
4. Place each syringe in washing basket
5. Sort sizes if necessary
6. Repeat process approximately 700 times each basket for four baskets
7. Place each basket in machine (90° turn—no steps)
8. Fill machine with detergent solution
9. Run wash cycle
10. Drain and refill machine with fresh water (in continuous flow)
11. Run rinse cycle
12. Remove each basket and carry to water still (four trips—three returns)
13. Give final rinse of distilled water to each basket
14. Place baskets on mobile syringe cart (move cart to still; four trips—three returns)
15. Cover baskets.

SUMMARY: To clean 2,600 syringes

	Number	Saving
Operations	7,806 total	124
Storage delays	3 total	49
Inspections	1 total	1
Transportations	7 total	292

After the general flow is satisfactory, work stations should receive attention with the aid of right and left hand charts. Two examples of improved methods are given.

CLEANING SYRINGES

Improved Method

Inspection

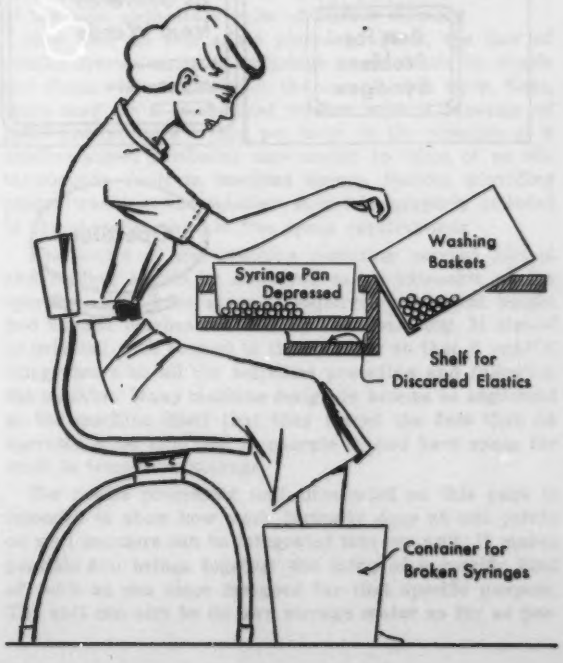
LEFT HAND	RIGHT HAND
1. Drain detergent from pans	Drain detergent from pans
2. Arrange four baskets in arc; prop	Arrange four baskets in arc; prop
3. Place first soak pan—front center	Place elastic bands right
4. Place two discard pans left	Place one discard pan right
5. Pick up syringe and inspect	Pick up elastic band
6. Remove used elastic band	Put band in place
7. Place syringe in basket 1 or 2	—
8. Pick up syringe and inspect	Pick up elastic band
9. Remove used elastic band	Put band in place
10. —	Pack syringe in basket 3 or 4
11. Pick up syringe and inspect	Pick up elastic band
12. Remove used elastic band	Put band in place
13. —	Pack syringe in basket 3 or 4
14. Pick up syringe and inspect	Pick up elastic band
15. Alternate place in discard pan	Replace elastic

Repeat until all syringes in pan have been packed, and all pans emptied and set aside

WASHING SYRINGES

Improved Method

LEFT HAND	RIGHT HAND
16. Open valve to fill machine	Place (one scoop*) detergent in machine
17. Put cover on basket	Put cover on basket
18. Load baskets in machine	Load baskets in machine
19. Press switch to start wash cycle	Close valve to stop water flow
20. Clear work area	Clear work area
21. Press switch to start wash cycle	Open drain valve
22. Open valve to fill machine	—
23. Press switch to start rinse cycle	Adjust valve to govern water flow
24. Press switch to stop cycle	Open door
25. Unload baskets	Unload baskets
26. Place baskets in sink	Place baskets in sink
27. Rinse baskets with distilled water	Rinse baskets with distilled water
28. Place baskets on counter for packing	Place baskets on counter for packing



When the work load is fairly substantial, it will pay to have special work stations for inspection, with baskets depressed on an angle to shorten the transport distance and improve the angle of visibility. Depressing the supply pan would be a further improvement. In addition to saving time by a slightly shorter transport, a more normal arm position would substantially reduce fatigue.

Storage requirements at inspection station:

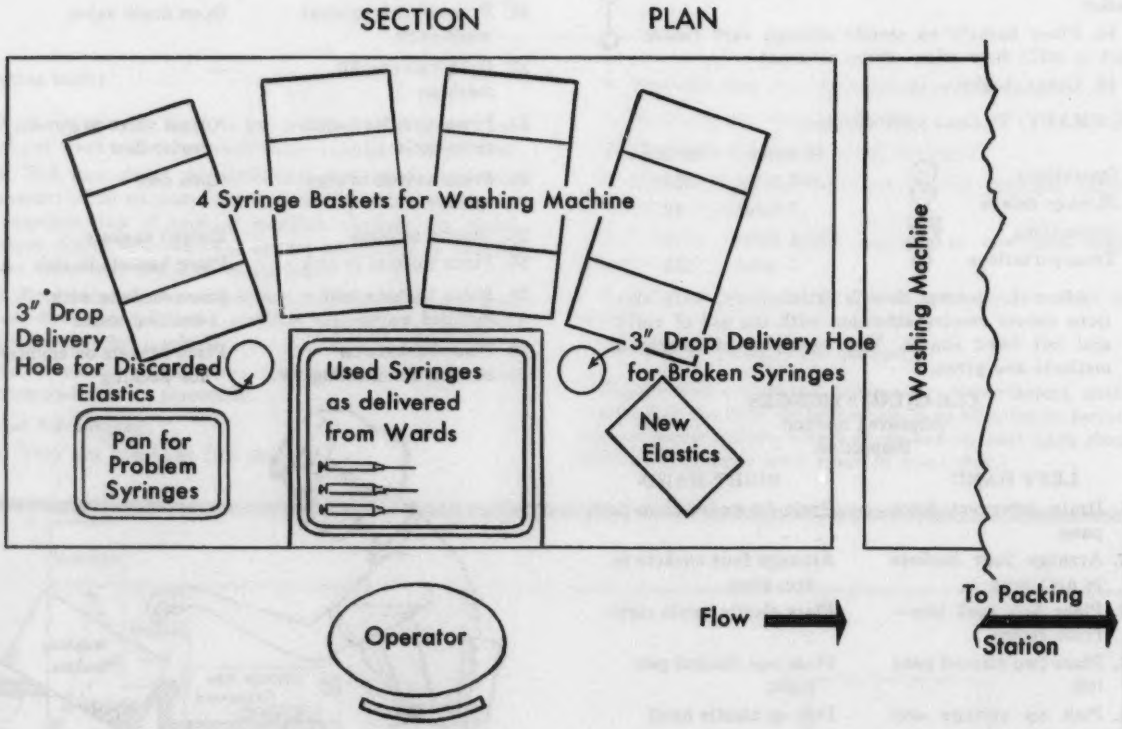
1. Emptied syringe pans
2. Four washing baskets
3. Pan for breakage
4. Stuck syringes
5. Used elastics
6. New elastics

Knowing now what it takes to get efficient output on syringe processing, one can do the proper planning for this work in a new C.S.R. It must be remembered, however, that syringe processing is only one of a number of jobs that must flow through and be done in areas sometimes shared with other work.

The production line in industry is made more efficient, the line itself gets more complex, but the element of labor on the line is thereby substantially reduced, ultimately approaching the point of complete elimination. We will illustrate this concept as applied to C.S.R. planning with a very simple example.

As was mentioned in the first article of this series , the average C.S.R. has a simple work counter running more or less around the periphery of the work area. This is the simplest possible type of production line and conversely will entail the highest labor element per production unit.

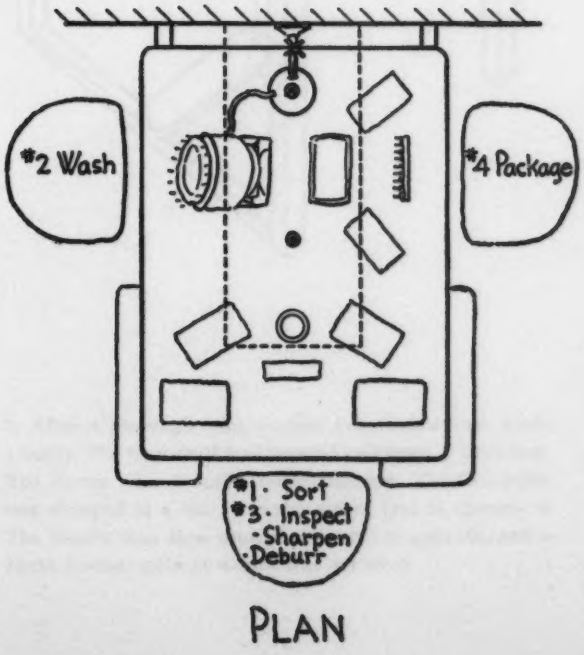
As a first improvement a spur can be introduced in the line for the syringe work, for example, so that the flow of other work from the disassemble and clean up area can easily bypass the syringe processing. Not only does this measure increase efficiency, but it also introduces flexibility, because the spur can more easily be altered to suit changing requirements than a continuous built-in wall counter. Later we will show how this idea can be further developed to advantage. Eventually we would have those units fixed which required service connections. Others would be portable or easily altered for maximum flexibility, an arrangement which Carl Walter M.D., has been advocating for years.



Needle Processing

By Frederick E. Markus, Markus & Nocka, Boston, Mass.,
in collaboration with
Mrs. Jean Christie, R.N., Free Hospital for Women, Brookline, Mass.

● Laboratory assignments for industrial engineering students consist primarily of projects, borrowed by courtesy, from nearby industries. In this category the processing of used hypodermic needles would qualify as an ideal project. First, equipment and product are quite portable. Secondly, but most important, is the great variety of methods which can be developed with the assurance of substantial time savings. Finally, with work place jigs and fixtures painted in fanciful colors, sets of before and after timed motion pictures can readily be made for record and used as teaching aids.



PLAN

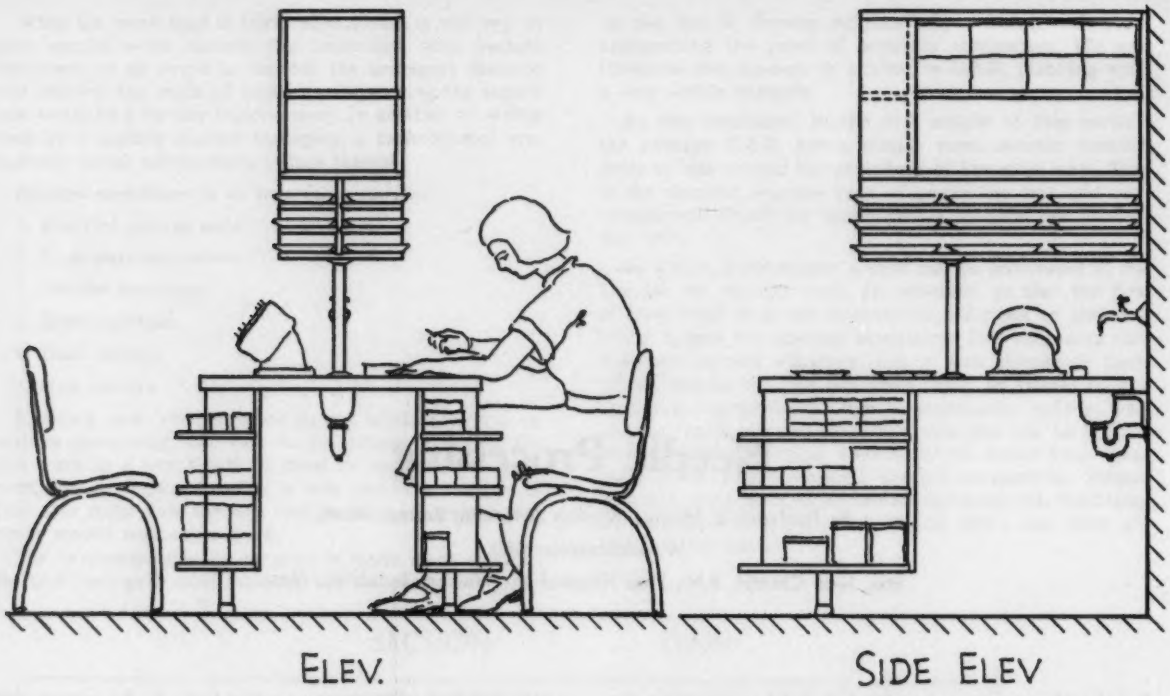
For the average size hospital of about 200 beds, the processing of needles is not a big job—generally not even a full-time job for one person. However, a 1,000-bed hospital might have 15,000 needles to do per week and thereby have four or five persons working on them full-time. A detailed study of flow and methods could cut this number of workers substantially. It is important to establish not only the "how" of doing, but also "how long" this doing should take.

Some of the most wasteful motions which are obvious at a glance are, for example, picking up a needle with one hand and loading it with the other, plus other violations of the most elementary rules of motion economy.

How does all this affect planning? First, the flow of needles from cleanup to autoclave truck should be simple and direct without getting in the way of other work. Next, there may be a mechanical washer with a capacity of 1,000 needles more or less per hour. In the selection of a needle-washer, particular note should be taken of an all-too-common fault in machine design. Besides providing proper washing, the machine should be properly oriented to the operator and his free space requirements.

The design of any machine requiring manual control and feeding should be conceived as an extension of the operator, with knee space if required, convenient height and normal reaches for feeding and operating. It should be oriented with respect to the operator so that it readily integrates with all the activities preceding and following the machine. Many machine designers become so engrossed in the machine itself that they forget the fact that an operator must still feed it, operate it, and have space for stock in temporary storage.

The needle processing unit illustrated on this page is intended to show how work formerly done at odd points on wall counters can be integrated into one unit. It makes possible and brings together the doing of a specific kind of work at one place designed for that specific purpose. The unit can also be its own storage center so far as pos-



sible. It should be made of inexpensive materials and should be easy to alter, versatile and ultimately expendable when technics change.

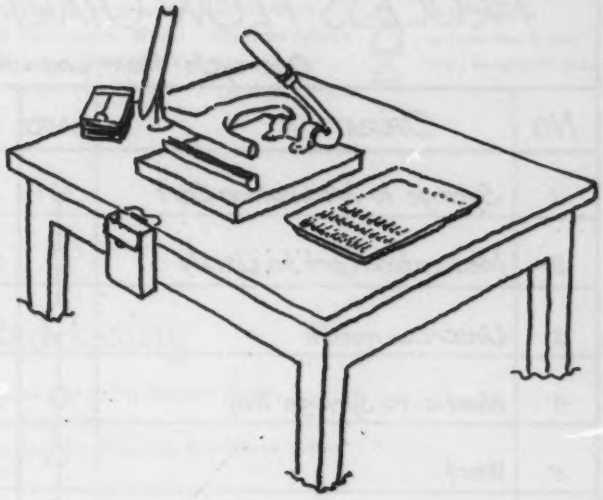
The unit has three work stations, but one doubles for two activities. For its size as shown, it would accommodate at most two operators at any one time. For three operators it would need to be somewhat larger. The output would depend on the method employed and the quality of "tooling."

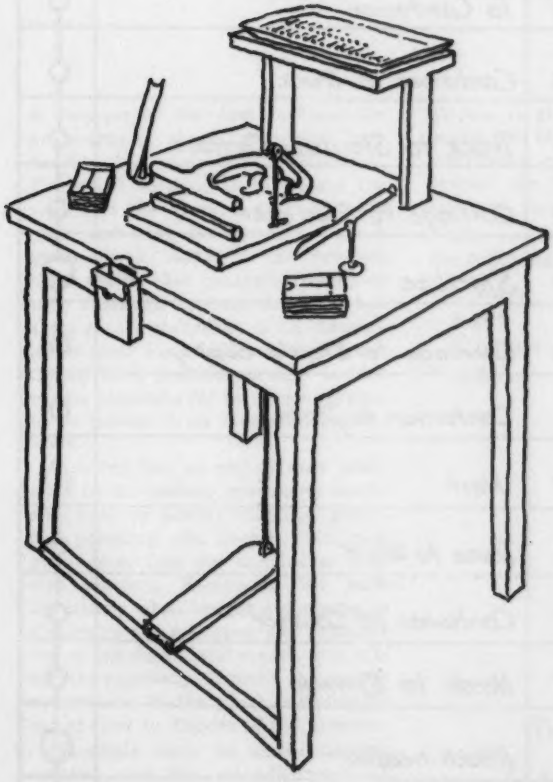
Such a unit in itself would encourage improvements in methods and performance, and add interest to otherwise routine work.

The several methods in general use for packaging needles all offer themselves as interesting subjects for work simplification. The recent introduction of paper packaging necessitates a tooling job if the method is to compete in cost with the use of glass restriction tubes.

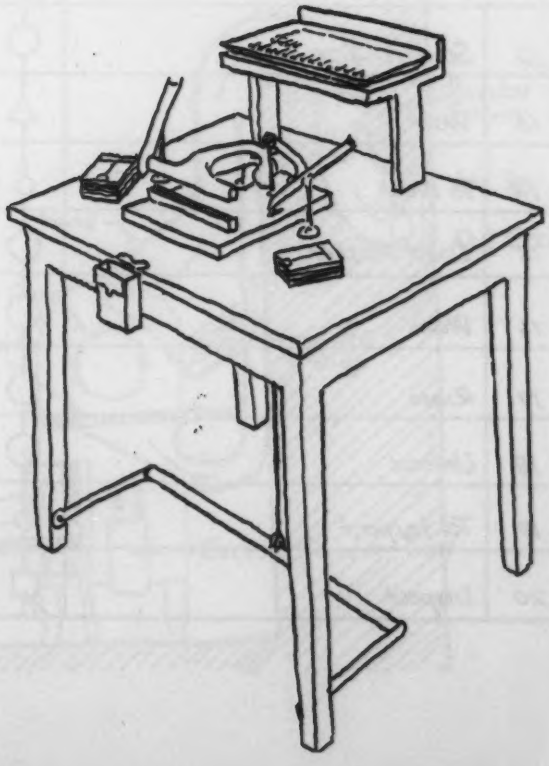
Shown here are two successive improvements on an original tooling attempt.

1. In the first setup, right, the left hand held the envelope to a chute down which the right hand fed the needle from a tray. The envelope was then positioned at the electrical sealer which the right hand operated.





2. The first improvement, left, was to load two envelopes at a time with two chutes, employing both hands and operating the sealer with a foot pedal. This improvement increased output close to 100 percent.



3. After a thorough trial, further refinements were made (right). The tray shelf was lowered and given a back stop. The chutes were brought closer together. The foot pedal was changed to a bar to enable either foot to operate it. The fixture was then somewhat easier to operate, and a slight further gain in output was achieved.

PROCESS FLOW CHART OF HYPODERMIC NEEDLE

One cycle from one use to the next use

NO.	OPERATION	SYMBOL	NO.	OPERATION	SYMBOL
1	Syringe to Medication Cart		21	Sharpen	
2	Medication Cart to Utility		22	De-burr	
3	Unscrew needle		23	To Pack	
4	Needle to Syringe Tray		24	Pack	
5	Wait		25	To Container	
6	Syringe Tray to Cart		26	Container to Truck	
7	Cart to C.S.R.		27	Truck to Sterilizer Carriage	
8	Syringe Tray to Clean-up		28	Carriage to Sterilizer	
9	Needle to Needle Tray		29	Sterilize	
10	Needle Tray to Sort		30	Carriage to Sterile Supply	
11	Wait		31	Container to Truck	
12	Sort to Size Trays		32	Wait	
13	Wait		33	Truck to Ward	
14	To Wash		34	Container to Counter	
15	Load Washer		35	Needle to Syringe	
16	Wash		36	Attach needles	
17	Rinse		37	Syringe to Tray	
18	Unload		38	Tray to Treatment Cart	
19	To Inspect		39	Syringe to Patient	
20	Inspect		40	Inject Needle	

The day may not be far off when disposable needles will be in use. To understand the economics of this problem, one must consider the complete work cycle of a needle from one use to the next. It will show that there is considerable work involved in processing a used needle for reuse. Work simplification based on a flow chart study (see opposite page) should help to reduce the labor cost on needles.

Operations
Storage delays
Inspections
Transportations

At left is key to symbols used in flow chart on opposite page.

Glove Processing

By Frederick E. Markus, Markus & Nocka, Boston, Mass.,
in collaboration with
Mrs. Jean Christie, R.N., Free Hospital for Women, Brookline, Mass.

● Because of the dust problem the processing of gloves, no matter how handled, has never been satisfactory. The usual solution is to isolate the work and the operator to a separate room and have the operator wear a gauze mask. Actually, the laws of most states that concern themselves with industrial hygiene would not tolerate such a makeshift in an industry under their jurisdiction. But, as mentioned in a previous article in this series, hospitals, for no reason, appear to be exempt from industrial regulations.

Industry has no end of dust problems in its various processing methods, such as sawing, sanding, grinding, polishing, etc. Despite their predominance, they are handled as routine matters. Equipment for such operations when bought anticipates in its design the collection and exhausting of the dust it will create, and it is merely necessary to make the proper connections to the plant dust-collecting system to dispose of the problem.

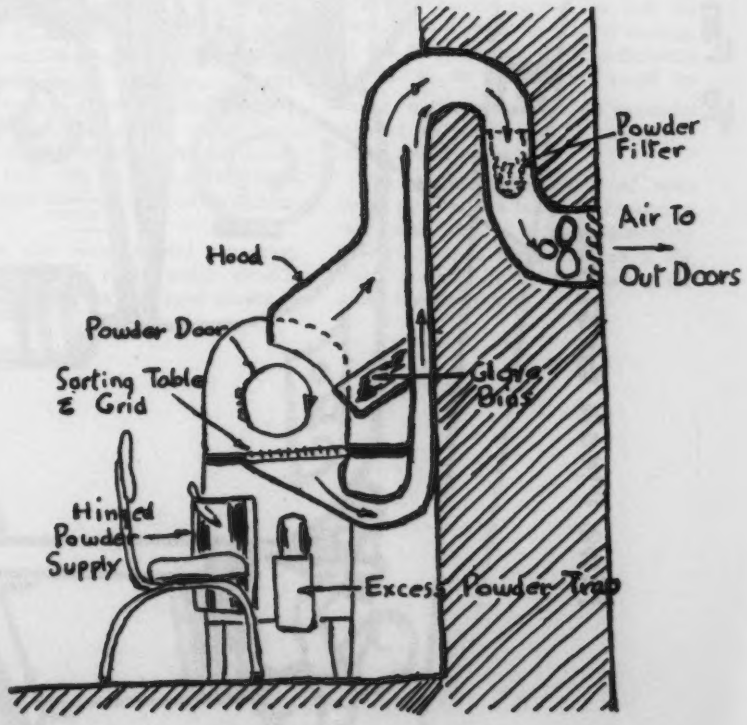
Hospitals have no dust-collecting system, and the manufacturers of glove-processing equipment therefore make no provisions for suitable exhaust connections. It is still possible to improvise by one means or another some method of catching the dust and tying into a collecting filter. (See illustration at right) If this is done, a separate room for processing gloves is no longer necessary.

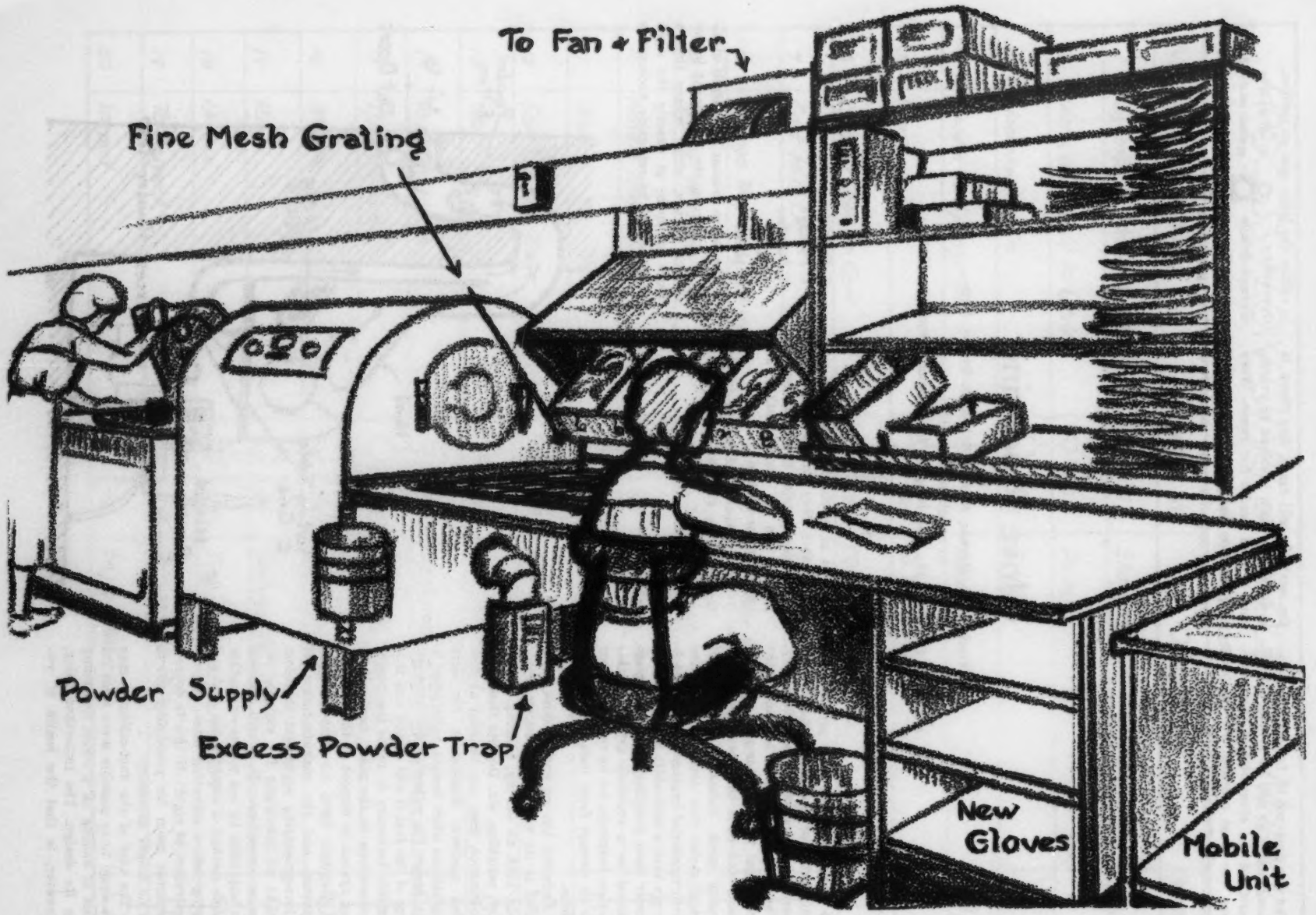
The cost of the dust-collector may be equal to or possibly more than the cost of closing off a room, depending on its design. The important thing, however, is that the health of employees is given the maximum safeguard. One other notable factor is that the powder carried out by the exhaust system can be reused rather than swept up for discard.

The processing of gloves involves the following subdivisions of work:

1. Wash
2. Dry
3. Inspect
4. Sort
5. Powder
6. Package
7. Sterilize
8. Store
9. Issue.

The entire process lends itself ideally to lining up the equipment in sequence of use, which means that a block of space at exactly the right point should be set aside exclusively




To Fan + Filter
Fine Mesh Grating
Powder Supply
Excess Powder Trap
New Gloves
Mobile Unit

for this work. Too frequently one finds the work being done at scattered locations, necessitating frequent trips back and forth across the room.

WASHING

Washing can be done either in the hospital laundry or in a household-type washer located in central supply. If the latter is used, the following points should be observed:

1. The water temperature should be not over 100° followed by cold water.

2. The interior of the washing drum should contain no copper.

The average household washer will wash and rinse 300 gloves in 25 minutes.

DRYING

While the smaller hospital may still resort to peg racks for drying gloves, most will make use of one of the mechanical driers on the market made especially for gloves. It seems safe to say that the hospital of 100 beds and over would find the mechanical drier more efficient and more economical than paying for an extra pair of hands.

INSPECT-SORT

We assume these two items are best done at one work station and as one operation. In addition, we assume that new supplies, both gloves and containers, will be stored here. For the work of sorting, provisions should be made for sufficient bins to accommodate the size ranges carried, plus space for rejects and provisions for discards. Inspecting (by hand or by machine) and sorting are also usually combined with the turning of each glove.

POWDERING

Again, the small hospital may use an armhole box for powdering the small number of gloves used, but the trend here is also toward mechanical powdering. Results are more uniform and the use of powder more economical. At the Free Hospital for Women, in Brookline, Mass., the combination drying and powdering machine was raised 17 inches from the floor to bring the loading and unloading to a convenient height. This also enabled the powder door to open above and onto the counter and get under the dust-collecting hood.

PACKAGING

Packaging can be done at the same stations as inspecting and sorting, or it may move off to an adjacent station. This will depend on how the powdering is done, on the one hand, and how the envelopes are loaded for sterilization, on the other hand. If crepe paper envelopes are used in place of linen and the supply for "pick-up" is above work-table height, it is advantageous to slope the shelf down toward the table for easier pick-up and positioning. This does not work for muslin wrappers. Finally, the finished article should be placed immediately in the sterilizer basket, which in turn is best kept on a small truck for transfer to the sterilizing carriage. All these requirements should be carefully anticipated in planning.

STERILIZING

There is difference of opinion on the length of time that gloves should be sterilized. Obviously, prolonged heat is detrimental to their potential life. Some believe that no great harm is done by sterilizing with other items the usual 30 minutes. Others recommend that they be separately sterilized, with the time reduced to 15 minutes.

It is also recommended that they be sterilized in racks which provide space between the packaged gloves in the autoclave. Dr. Carl Walter advocates that gloves be placed in the autoclave with the thumbs in upright position. The provision of sterilizing racks aids in checking this important point. If muslin wrappers are used, they may be sprinkled before autoclaving, to prevent superheating.

STORAGE

Stored gloves, like all rubber goods, last longer if stored in temperature somewhat lower than normal room temperature. They should therefore be stored in the coolest part of the room. Still better results are obtained if they are stored in some especially cooled place.

At the Free Hospital for Women, where the first (to our knowledge) dust-collecting system for glove processing has been installed, the dust is drawn off by an exhaust fan system and collected in a baffled filter.

The actual draw-off is accomplished by (1) a hood, which straddles both the door of the powder machine and the sorting table, and (2) by a hopper below the sorting table which is topped with a fine mesh screen flush with the working surface of the sorting table. Thus the hood takes out the air-borne dust, and by falling through the screen over the hopper, the dropping dust is exhausted.

In other words, the hood does not produce enough suction to pick up dust, once it rests on a level surface. If the suction were made sufficiently strong to do so, gloves would be sucked out with the dust. An excessive flow of air would also be uncomfortable for the operator.

The proper relationship of open space at hood and hopper air velocity, fan speed, etc., is a fine engineering problem and is recognized as a distinct specialty by the ventilating engineering profession.

Model C.S.R. Floor Plans

By Frederick E. Markus, Markus & Nocka, Boston, Mass.,
in collaboration with
Mrs. Jean Christie, R.N., Free Hospital for Women, Brookline, Mass.

● In previous articles means were explored for performing more efficiently various types of work in central service. Now it is time to consider the department as a whole.

Experience in industry has demonstrated that when line production is possible, substantial savings in labor can be made. Therefore, despite the variety of work with which central service must cope, we will try for line production wherever possible. We will also, as mentioned previously, make most work stations separate entities, expendable if need be, made of inexpensive and easily altered materials. In other words, we will not only anticipate but encourage change.

It has been customary to expand a central service plan by using as a guide a "square foot per bed" formula. Since the designer knows nothing of the procedures involved, he simply increases the space allotment for each work area and usually decreases the efficiency of the work station in the process. The amount of expansion to be built into any work area therefore should be determined by someone thoroughly familiar with the methods to be used, the size of the operation, and efficient line production.

Also, the 100-bed hospital central service does the same basic jobs as the 1000-bed central service, and may in fact also be called upon to perform additional duties which are more administrative in nature. Each hospital therefore requires thorough study as an individual problem.

There are first the immediate requirements of a particular hospital. But requirements may change. For example, such items as the following should be considered:

Expanding duties

More administrative functions

Number of shifts worked

How the shifts are staffed

These items may necessitate considerable deviation from the usual square foot ratio and number of employees per 100 beds. For example, the central service designed for the Free Hospital for Women, illustrated on page 118, has about 50 percent more area than considered necessary by the usual formula. Yet it has just enough space to perform the jobs required of it.

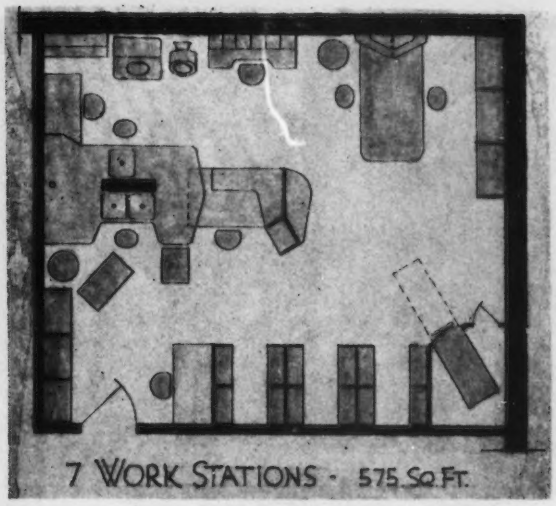
Line flow produces recognizable patterns for different kinds of work. For example, certain industries have a perfectly straight production line going from the receiving end of a building to the delivery end. Some types of work require right-angle turns to facilitate positioning and indexing the work. Assembly lines for cars are straight but have many feeder lines.

Putting central service work on a line basis has produced its own set of patterns. For any work laid out on a line basis it is necessary to establish specific work stations and the optimum division of operations. Finally, when continuity is wanted between two or more stations there is the problem of timing, by which work elements are reduced to the closest possible common denominator. This is, of course, only necessary when stations are manned simultaneously. It may appear that this is too much to expect of central service work. However, nothing is ever accomplished by starting with a faint heart.

The main work flow in central service starts, in general, with receiving, followed by disassembling and washing. From washing, work flows to one of four or more lines, namely, gloves, needles, syringes, sets, and possibly solutions. Sets might require more than one line to take care of the greater proportional volume. Where timing cannot be reasonably balanced between simultaneously manned stations, space must be provided for material to accumulate in "banks."

Linen will require a secondary production line which must join at the proper point the main flow of work. Finally there may be a third set of work stations which perform odd jobs, such as the making of chest suction sets, special dressings, etc. The desirability of supplying water, electrical outlets, compressed air, and vacuum to this type of work station requires knowledge of the work to be performed here.

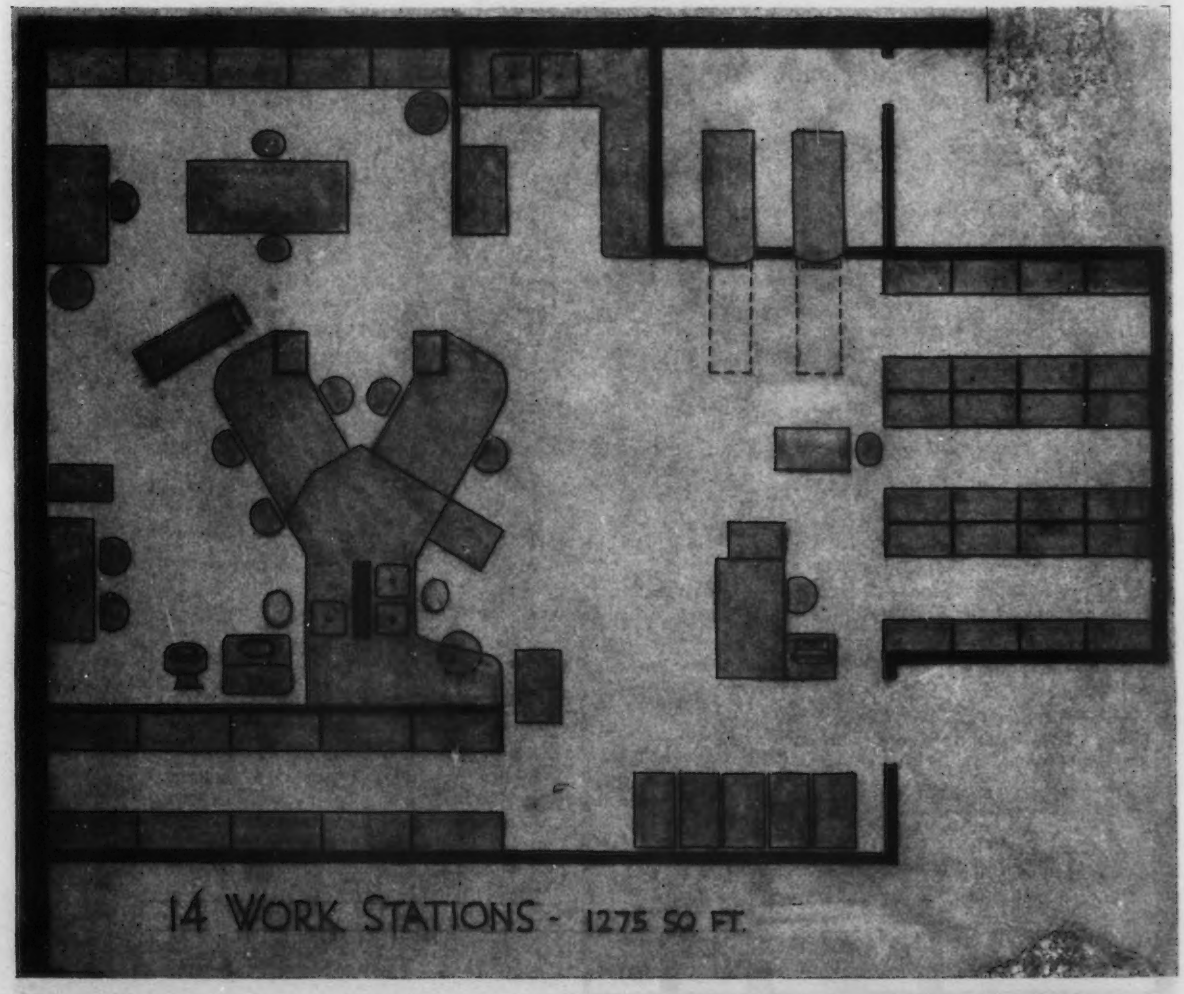
Certain matters of policy must also receive consideration. Will all solutions be made or some bought? Will central service handle the issuing of splints, etc.? What about lounge and lockers for employees? In presenting a basic plan pattern we have arbitrarily included most of these

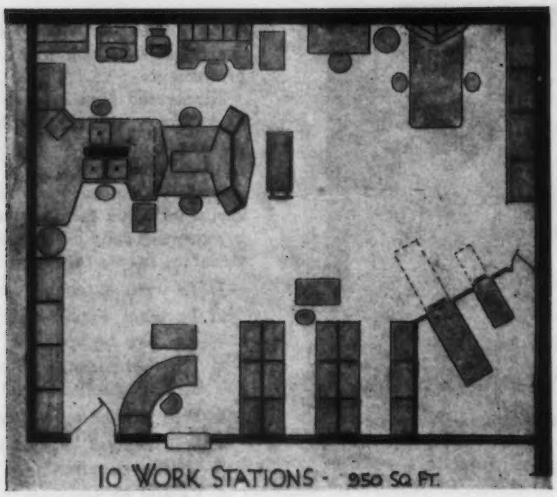


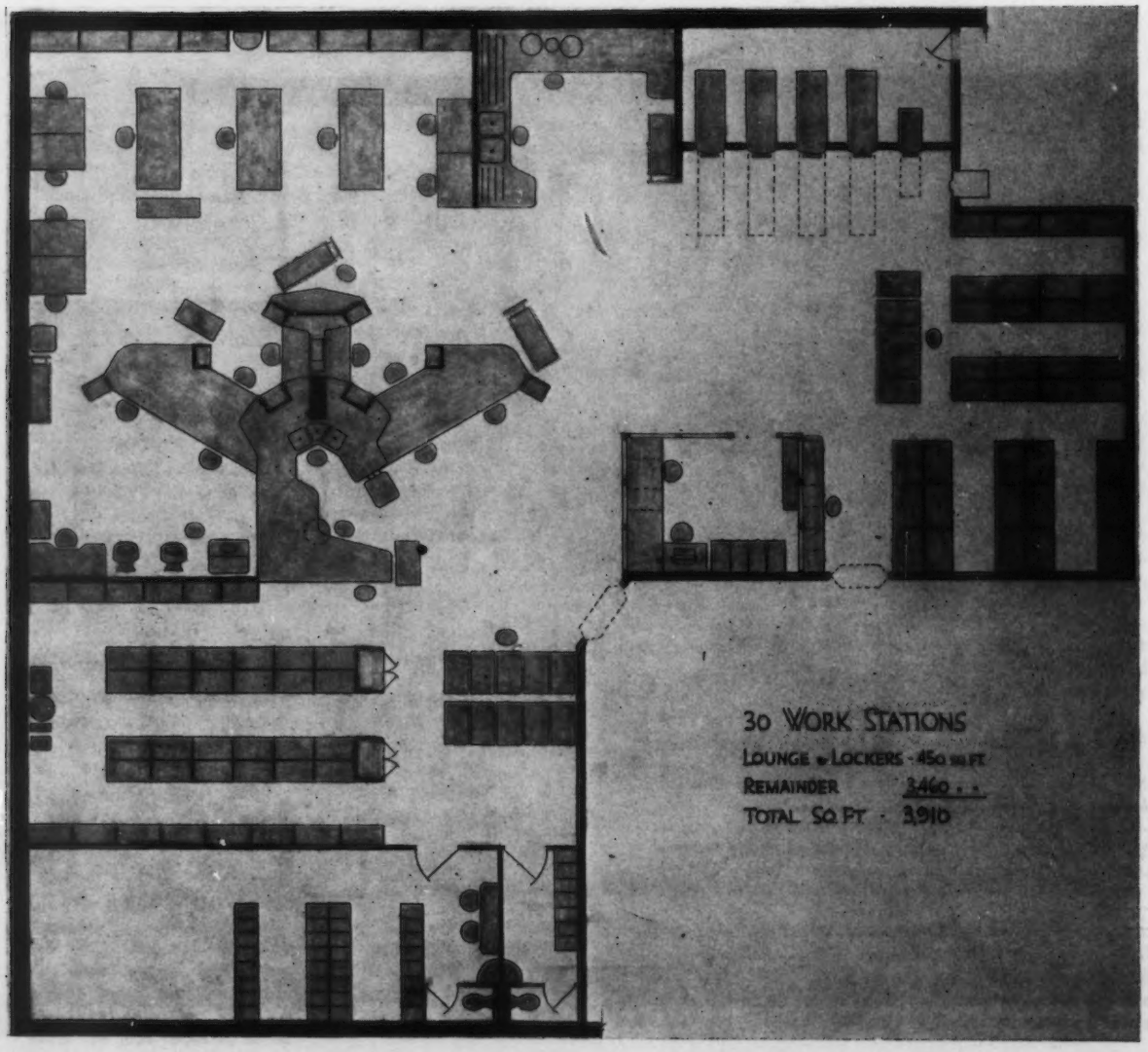
elements for the sake of completeness. The plan, in general, should be one which will lend itself to constant improvement.

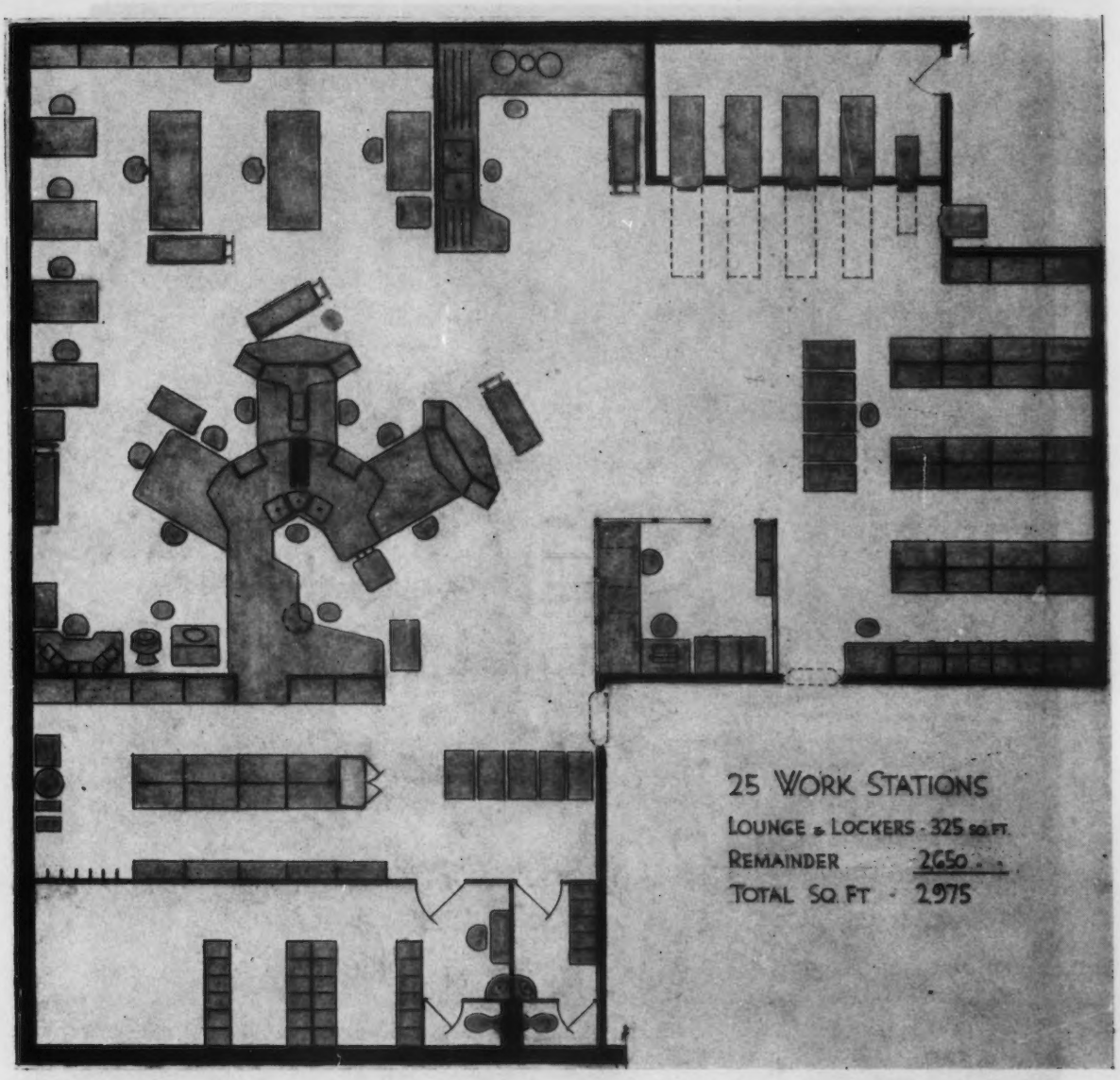
Illustrated here and on page 114, are five hypothetical plans for central service departments of varying work capacity. Originally it was felt that it would be very convenient to have a series of plans starting at 50-bed capacity and graduating up to 1,000 beds or more which could be easily adjusted for specific requirements. As the problem is more carefully scrutinized, however, it seems that many variables may effect both size and details, for example:

1. To what extent, if any, will solutions be made?
2. To what extent will pre-manufactured stock or assemblies be bought?
3. To what extent will central service relieve wards and other departments of work they now may do?
4. Will service be call or scheduled delivery?
5. Will central service issue splints, oxygen tents, and similar supplies?
6. Should an increase in future services be anticipated?



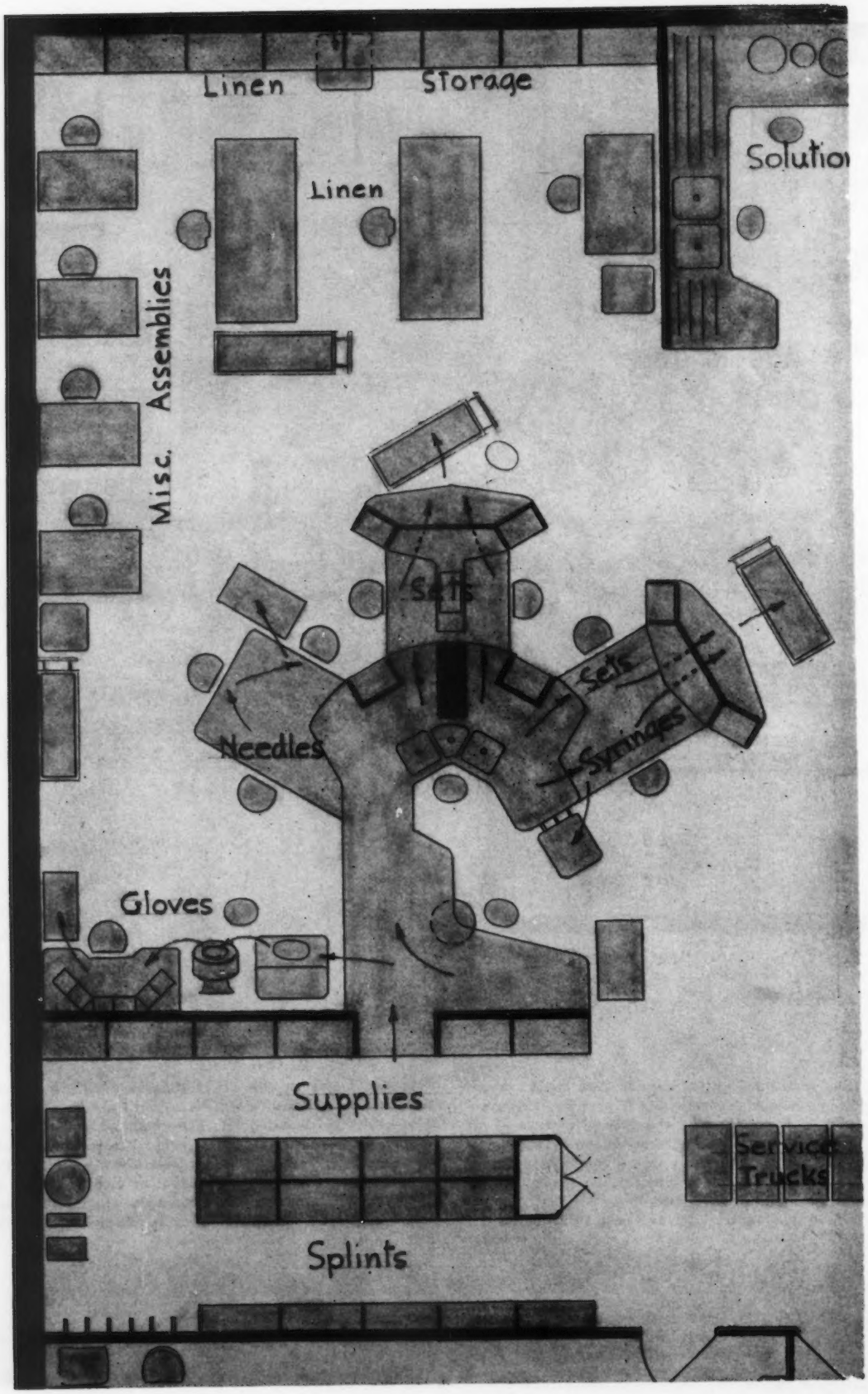

10 WORK STATIONS - 950 SQ. FT.

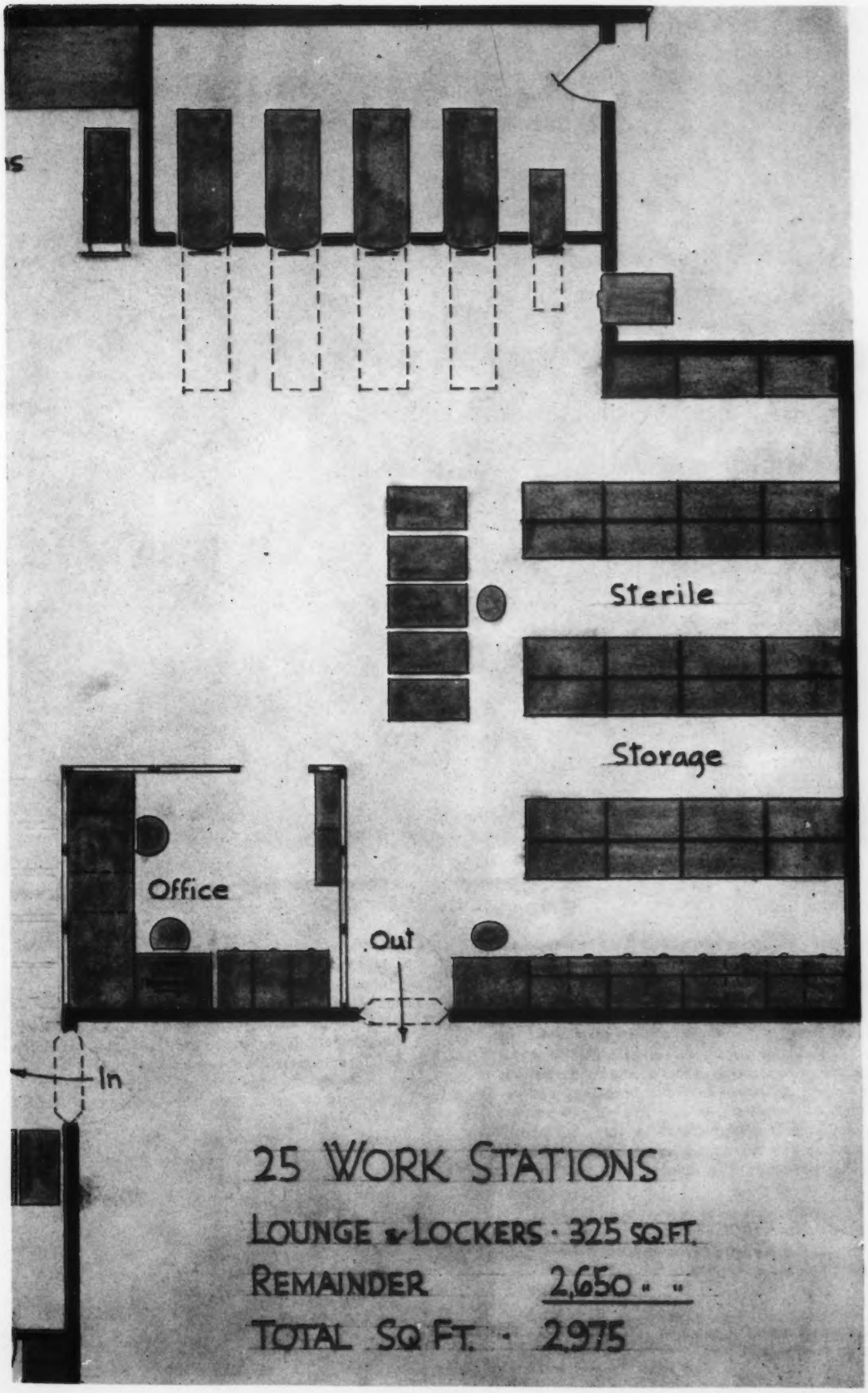

30 WORK STATIONS
LOUNGE + LOCKERS - 450 SQ FT
REMAINDER 3460 . .
TOTAL SQ FT - 3910

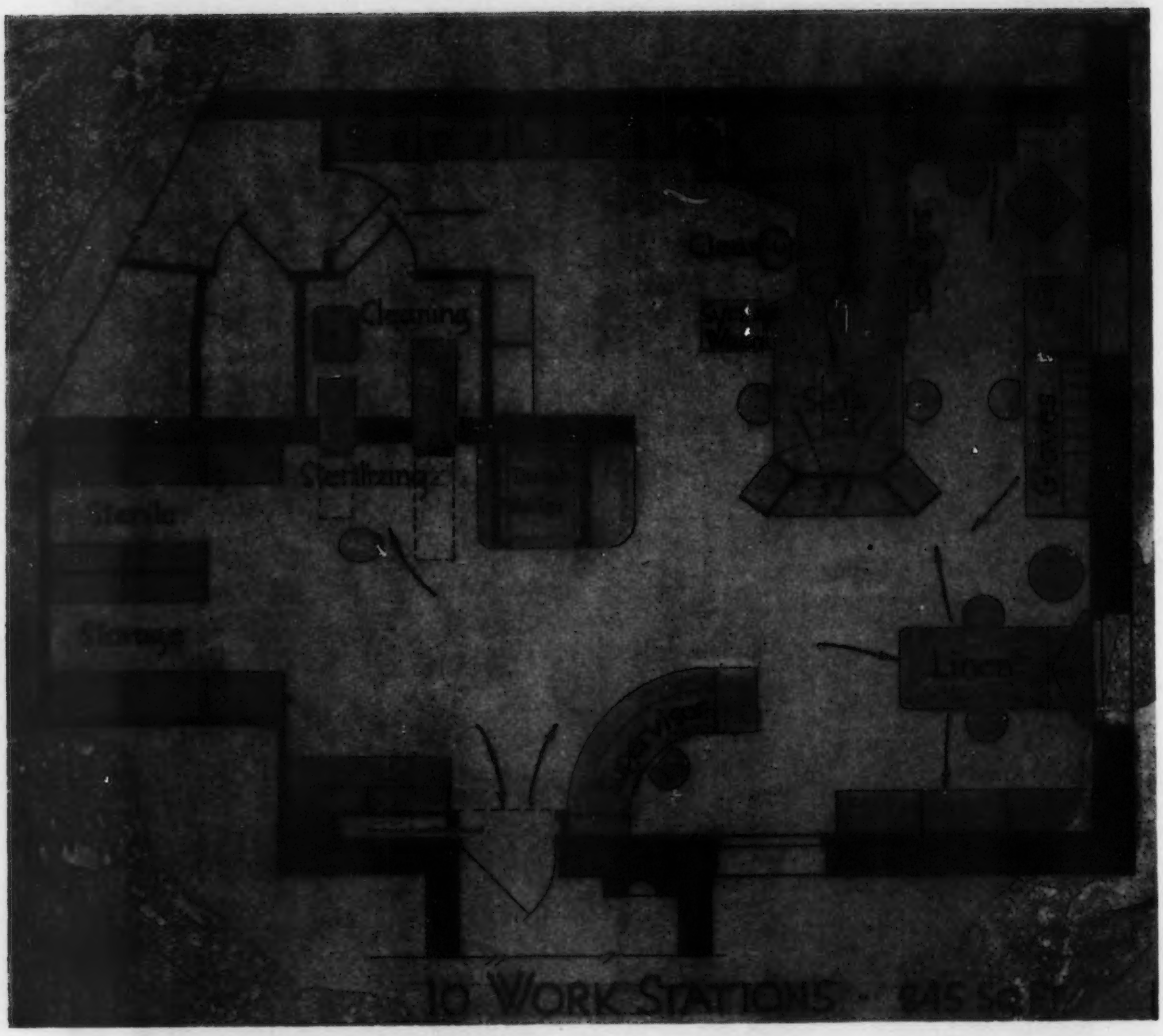


It will be seen that central service that could service 500 beds in one case might not suffice in another. However, it should also be apparent that the general pattern of an efficient central service does not change much with size. Especially, it should be evident that a long narrow area can, by no stretch of the imagination, be made into an efficient central supply department.

The above central service plan has been enlarged on the next two pages to show in detail the facilities contemplated and the flow of work. Note that every work station is specifically accounted for. They may, of course, not all be manned simultaneously. For central service work there must be fewer workers than work stations to give flexibility. To be noted also is the fact that an efficient, easily supervised department requires a space which is approximately square. A long, narrow cut-up area is entirely un-


Linen
Storage
Solution
Linen
Misc. Assemblies
Sets
Sets
Needles
Syringes
Gloves
Supplies
Service Trucks
Splints


Sterile
Storage
Office
Out
In
25 WORK STATIONS
LOUNGE & LOCKERS · 325 SQ FT.
REMAINDER 2,650 " "
TOTAL SQ FT. · 2975



suited for efficient central service work, since it wastes labor hours in unnecessary travel and transportation, and makes thorough supervision impossible.

The first central service department designed in accordance with this study (shown above) is now in use at the Free Hospital for Women in Brookline, Mass. This hospital has 96 beds, three operating rooms, and a large out patient department, and specializes in gynecology and research. It buys all solutions except irrigating solutions. There are no orthopedic requirements as such, but otherwise this central service takes on a larger amount of work than is usual in most hospitals, does its own pick-up and delivery of supplies, and relieves wards and other departments of many odd jobs.

It was found, therefore that about 50 percent more area was needed than is generally assumed adequate for this size hospital. This hospital previously had no central service department. The space used is reasonably convenient to all departments serviced, and to lounge and locker facilities. Despite its heavy work load, this department is open only 10 hours a day, five days a week, and has only four workers.

This central supply could serve a somewhat larger hospital except for its storage for supplies and sterile goods, which would need to be increased.

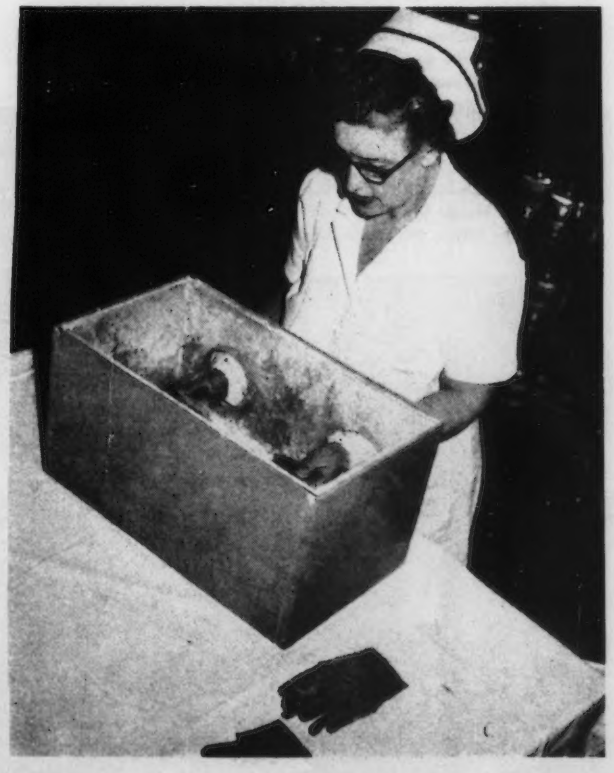
We Made Our Own Glove Powdering Device

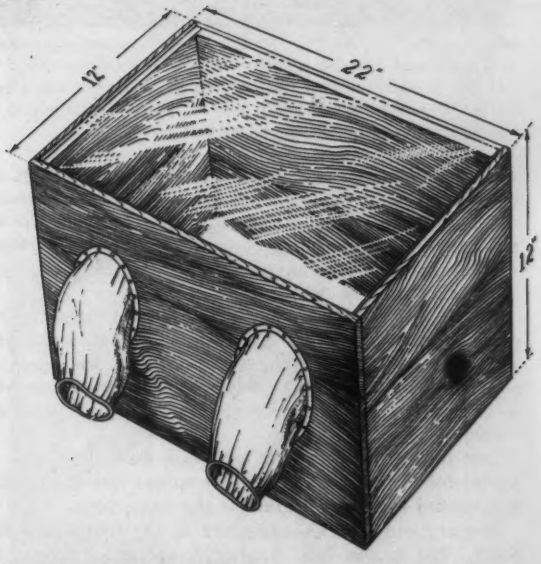
By R. D. Manning, Controller, and
Miss Pauline Wilson, R.N., Central Service Supervisor

Bataan Memorial Methodist Hospital
Albuquerque, New Mexico

● When our hospital opened for patients, we lacked many of the smaller items of equipment which save time but which can be "done without". Today we are still not in a financial position that permits us to purchase all the equipment which we would like to have; therefore it has been necessary for us to improvise and "make-do." A case in point is our glove powdering device.

We had no glove powdering device and did not wish to spend money for one, so our Director of Nursing Service suggested that we make one. She designed a very simple box which our Maintenance Department made from plywood and glass. A picture of it is shown on this page. The box proved so successful that two more were made. They have been in use over two years and should last indefinitely.





Above: Tight, practically dust-free box measures 22" x 12" x 12". The hand-holes are 4¼" in diameter, spaced on 12" centers.

Left: Miss Pauline Wilson, R.N., Central Service Supervisor, is shown demonstrating use of the box. The glass lid on top gives full visibility and slides out for cleaning.

Departments Function Smoothly Under System Of Direct Responsibility to Administration

By Ruth E. Pendleton, R.N.
Director of Surgeries and Central Supply Room
New England Deaconess Hospital, Boston, Mass.

Mrs. Priscilla Tinkham (r.), Miss Pendleton's secretary, brings in procedure book, showing what is required for each operation. One is found in each room, so that information is readily available on Kardex for reference, and one is kept at the nurses' station, so that the night staff can have ready access to it.

● At the New England Deaconess Hospital, surgery, central supply, and the recovery room have been operating for more than a year as one unit, directly under the hospital administration rather than the nursing department. During this period we have been convinced that our organizational plan was wise.

The line of responsibility is transferred from the hospital administrator to the director of surgeries and central supply, and in turn to the supervisors of the operating rooms and central supply. The operating room supervisor is responsible for the recovery room, which is a unit within the operating room.

Our physical layout — in our new building — was designed for the new system; so we moved into the building and started the new program at the same time.

Surgery and central supply are on the fourth and fifth floors. The fourth floor has eight operating rooms; the fifth floor has four more operating rooms and the central supply department. Also part of central supply is the solution room, which is under laboratory management.

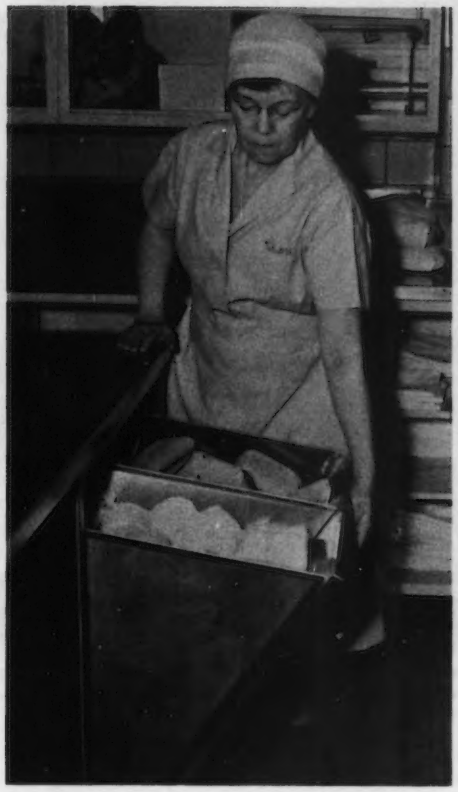
Before the present arrangement was adopted, central supply functioned as part of the operating room. Its personnel did sterilizing for the floors, but the functions of the department were necessarily limited.

Actually the changeover was accomplished quite easily. People who were doing modified central supply work in the old operating room were transferred into the new central supply department. The central supply supervisor is a nurse, but all other department personnel are lay people. New employees are trained on the job. The chief aide gradually breaks in a new person, who takes up one or two different things a day. It requires about a month to train the new person to do almost everything. We try to break in our employees to do every procedure, instead of preparing them to do only one job.

Interviewing of prospective employees for both departments is done in conjunction with the hospital personnel office. No one is hired for either department without being referred first to the office of the director of surgeries and central supply for approval.

The operating room staff includes registered nurses, aides, orderlies, and floor clerks. Lay personnel are trained on the job to assist and relieve the nurses for more vital work. Graduate and student inservice teaching programs are concentrated in 10 and eight-week periods respectively,

Mrs. Jean Christie, R.N. (l.), central supply room supervisor, watches as Mrs. Helen Winslow loads autoclave. Mrs. Anne DeArmon stands at other end of double-ended autoclave, in sterile supply section.

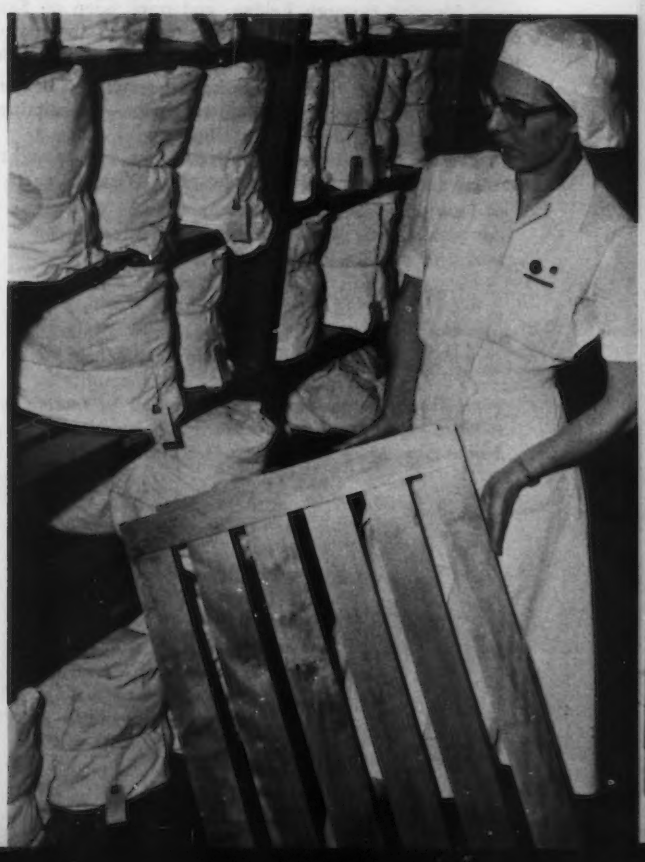


Mrs. Anne DeArmon opens bin used for bulk storage of prepared unsterile supplies, such as sheet wadding and dressing pads. Similar bins are used in sterile supply section for storage.

Above: Mrs. Palmer puts away glassware, making use of handy metal shelf which pulls out at convenient height for work level.

Department has ample built-in storage space. Here Mrs. Dorothy Palmer, chief aide, central supply, stands at shelves for gloves and suture boards.

Below: Miss Pendleton showing removable shelf board, built with spaces so that large packs could be put on boards while they are still warm. Boards also serve to promote circulation of air and eliminate condensation of steam.



There is plenty of storage space in each operating room, as well. Here, in corner cabinet, Miss Pendleton shows partitioned drawer in which catheters are stored.

Time and steps are saved by having phones in substerilizing rooms, so that nurses may phone out for supplies they need. Lillian Finizio, R.N., makes call to O.R. switchboard.

and are supplemented by monthly clinics and staff meetings.

Operations are scheduled for both morning and afternoon, Monday through Friday, and until noon on Saturday. Some staff doctors go to the clinic in the morning and operate in the afternoon; others reverse that schedule.

We have found that our exchange system—a combination of standard requisition and exchange—has eliminated over-ordering by working as follows:

Twice daily carts with used supplies are brought to central supply by hospital messengers. With the carts are requisitions for the supplies which the floors have used and are returning, and also for what they need in addition to standard articles.

Our central supply room serves all departments within the hospital with sterile and unsterile articles, small equipment, oxygen therapy equipment, and oxygen. Services to operating rooms include all supplies with the exception of instruments and those articles which are cold sterilized. Correlation with the operating rooms and central location within the hospital bring about effective functioning of the total unit.

Central Supply Service Discussed at New England Meeting

HOSPITAL TOPICS includes in its CS Department reports of CS discussions at the various hospital and nursing meetings. The following abstracts are typical.

Training of Personnel

Mathew J. Ustas, R.N., Formerly CS Supervisor, Lynn (Mass.) Hospital

BECAUSE of the critical shortage of nurses most hospitals are faced with the need to utilize lay people or non-professionals in the central supply department. It is impossible to compete with the wage scale of near-by industries. Therefore, staffing this department presents a problem. We have found, through experience, that our department attracts older women and married family women who need added income. In most cases they are totally unfamiliar with hospital work.

Any training program must bear in mind the background and experience of the individual to be trained and gear its teaching to the ability and learning capacity of each person.

The purpose of systematized training is:

A. To provide each member with adequate background and information concerning such equipment and functions for which he or she will be held responsible.

B. To completely familiarize the individual with the (1) rules, (2) policies, (3) procedures, and (4) technic of the department, so that each may confidently, intelligently, and efficiently perform her job.

The full potentialities of the central supply department are not yet completely understood by the administrative and nursing staffs of many hospitals. As a result little material is available on central supply room teaching programs.

The following training program is offered for consideration: It has been successful with us at Lynn Hospital and can be modified to various circumstances.

A. The potential employee is interviewed by the central supply room supervisor.
   1. Past experience is determined.
   2. A small dose of rules and policies is given. (Assuming she is hired and the activity of the department hasn't confused and discouraged her.)

B. Her first day includes (after appropriate welcome and introduction to members of the staff)—
   1. A short orientation talk by supervisor, who explains:
      a. The purpose of the central supply room in relation to the hospital.
      b. The physical layout and specific work areas.
         1. Sterilizing section.
         2. Receiving and dispensing area.
         3. Clean up and assembly area.
         4. Storage section.
   2. She is introduced and turned over to the individual who joined the staff last. This worker will instruct her in the technics of a few simple tasks.
   3. The usual method is to explain and then demonstrate the procedure. For example, folding linen, washing gloves, filling cans with sponges, etc.
   4. The worker should perform these procedures as soon as possible.

The reason for this is that too frequently we become so familiar with our work, we forget how different and confusing hospital work may be to someone entering it for the first time.

The new worker finds much in common with the "last new worker" who remembers too well the confusion. She feels freer to relax and ask questions. Past experience has shown that if time is taken in the beginning, better results are obtained in the long run.

   5. The progress of the new employee should be checked at intervals by the supervisor by—
      a. Conversation.
      b. Observation.

C. She is then reassigned to a senior member of the staff for further teaching (possibly on second day), or when the supervisor determines that basic orientation is satisfactory. She works with this older member of staff until she is capable of handling all phases of the department including:
   1. Receiving and dispensing sets
   2. Cleaning and assembling sets
   3. Operation of sterilizers
   4. Preparation and sterilization of solutions
   5. Becoming thoroughly acquainted with the maintenance and purpose of records, and the need to keep the information up to date, particularly the
      1. Kardex file—listing location of sets and contents of sets
      2. Daily requisition
      3. Daily work sheet
      4. Medical, surgical, oxygen slips
      5. Charge slips, etc.

One method of determining the progress made, is by using an *Experience Card.* The name of the new member is on top and it lists all the activities to be performed. For example:

1. Assembling sets
   a. Paracentesis
   b. Thoracentesis
2. Packaging for sterilization
   a. Gloves
   b. Sets
3. Dispensing special equipment
   a. Buck's extensions
   b. Hot pack machines
   c. Wangensteens

As the worker becomes familiar with each activity, the supervisor checks her *Experience Card.*

The use of the *Experience Card* calls for frequent reference to the Kardex file, thus, it is necessary to keep the latter up to date.

One way to facilitate and expedite the training of personnel is to have all procedures, technics, equipment, and records standardized within the department. This minimizes confusion.

D. Training may absorb from four to six weeks. At the end of this period, she should be prepared for a specific assignment. When the new worker assumes the responsibility for a specific job or jobs, she is often assigned to a senior member as a work team. Caution is exercised to join compatible personalities and greater efficiency results. These individuals work closely together and have time off simultaneously.

We have an unwritten rule that *all work* is the responsibility of each worker and it is possible to accomplish it with proper cooperation and application.

Whenever possible, each member initials his or her own work so that in case of error or doubt, a check may be made and traced directly back to the responsible individual. This check may be accomplished as in the case of sterile sets.

1. Worker puts initials on the outside of double wrapper.
2. Wards are instructed to return double wrapper at any time (*with* contents) in event of error.

The wards realize that, by this method, there is greater assurance of receiving correct sets, thereby saving themselves embarrassment and time. Here it cannot be overemphasized that neither personnel nor systems involved are perfect. Therefore, whenever a corrective action is taken the supervisor must exercise tact and patience, to avoid a reaction of resentment, and make certain that the worker understands the procedure and will be more cautious the next time.

The psychological effect of knowing that one's work can be checked, encourages the worker to be more diligent and conscientious. Often this will clear up misunderstandings and hazy directions and become a "sounding board" of the effectiveness of the teaching program.

Often, we, at Lynn Hospital, have arranged to take personnel (both new and old) on field trips to other central supply departments, in nearby areas. This stimulates interest and prompts a re-examination of our own procedures and an exchange of ideas. Frequently suggestions are volunteered by members of the staff and adopted if proven worthwhile. This is a booster to their morale and reflects in the quality and quantity of work produced.

A survey done by the Lowell General Hospital indicates the large range of activities possible in a central supply room. (See chart.) The chart indicates the staffing and broad scope of service rendered by central supply rooms in hospitals from 103 to 248 beds.

The central supply room, regardless of size, can be effectively used as a teaching instrument for student nurses as well as lay people. Here they may be taught individually the proper use of critical equipment through:

1. Lectures
2. Demonstration
3. Practical application

Proper *stress* is placed on careful handling of supplies and equipment to prevent loss and breakage, thereby combatting the rising cost of hospitalization to *the patient.*

Relationships to Administration

Mary E. Brackett, R.N., Associate Director of Nursing Service, Hartford (Conn.) Hospital—There are advantages in having the central supply department as part of nursing service. Our central supply is divided into two areas. Certain unsterile goods are placed in a department supervised by two male nurses. Sterile supplies are in a department staffed by three registered nurses—the supervisor, the assistant supervisor, and a staff nurse—and 27 non-

SURVEY OF STAFFING OF CENTRAL SUPPLY ROOMS

Average Census	PERSONNEL Tot.	RN	A	SN	ORD.	Misc.	Hrs. Stfd.	Pick up	Sterilize for DR.	Sterilize for OR.	Sterilize for Nurs.	Prepare Packs for DR.	Prepare Packs for OR.	Prepare Packs for Nurs.
248	21½	2	18	½	1	0	24	Y	Y	Y	Y	Y	Y	Y
224	14½	2	9	0	3	½	16	Y	N	Y	N	N	N	N
208	14	2	0	1	1	10	24	Y	Y	Y	Y	Y	Y	Y
194	20	3	17	0	0	0	13	Y	Y	Y	Y	N	Y	N
192	9	3	3	1	0	2	12	N	N	Y	N	N	N	N
187	9	2	0	0	0	7	12	N	Y	Y	Y	Y	N	Y
172	12	2	3	2	5	0	18	Y	Y	Y	Y	Y	Y	Y
168	17	2	5	0	0	10	12	Y	Y	Y	Y	N	N	N
148	6-2/7	1	5	0	2/7*	0	8	Y	Y	Y	N	Y	Y	N
140	8	5**	0	0	0	3	24	N	Y	N	Y	N	N	N
129	2	1	1	0	0	0	8	N	N	N	N	N	N	N
103	3	1	2	0	0	0	10	N	Y	N	Y	Y	N	Y

Y—Yes
N—No

*Saturday and Sunday
**Also staff Drug Room

RN—Registered Nurses
A—Aides
ORD.—Orderlies
SN—Student Nurses

nurse employees. Supervisors of both departments are directly responsible to nursing service.

The supervisors attend nursing meetings and learn directly of nursing needs. Frequent contact of nursing service and central supply personnel reduces the likelihood of unjust criticisms being made by one department against another. Possibilities for improved technics may be considered. Respect for the central department is increased when the supervisor gives a first-hand report.

The central supply supervisor must not be too accommodating about filling requests for special gadgets made by doctors and other personnel. If she accepts every suggestion, she will be bogged down so that she will not be able to fill routine needs.

An advisory committee for central supply offers a great opportunity to improve cooperation, reduce misunderstandings, and decrease frustrations in the supervisor's job.

Interdepartmental Relationships

Ruth L. Rochford, R.N., Supervisor, Central Supply Service, Rhode Island Hospital, Providence, R. I.—For proper integration employees need:

(1) Thorough knowledge of their job and a desire to learn the facts.

(2) Knowledge of what part their job plays in the overall work of the department.

(3) Ability to work well with all members of the team.

(4) Disposition to cooperate, work diligently, and participate in efforts.

When central supply room employees know their own jobs and their relation to the institution as a whole, a great step has been taken toward interdepartmental cooperation.

Good supervision is essential. A good supervisor will (1) command responsibility; (2) lead; (3) request instead of command; (4) reprimand in private; (5) keep discipline; (6) balance reprimands with praise.

Our department is directly responsible to hospital management, yet we do have good rapport with nursing service. Problems in nursing which may apply to central supply are referred to me. I investigate, and suggest a solution to nursing service.

We accept specific requests from interns and residents only if they go through the head of their department.

Financial Implications

Sister M. Annunciata, Administrator, Mercy Hospital, Portland, Me.—Economy is one of the major advantages of central supply service. The department's economic soundness is determined not by its size or cost of installation but by its functioning. A small department, centrally located and well planned, may function more efficiently than a larger operation.

Careful planning should be done by a committee including representatives of all departments which will be served by central supply.

Standardization is the most effective way to keep costs at a minimum. We should strive for economy of time, energy, and motion. To achieve success, we will need the cooperation of all people who use the equipment.

Another economic advantage of central supply is centralization, which provides economies in every phase of hospital operation. The committee must decide how much to centralize.

Economy of maintenance begins in the early stage of planning. Much more money and time will be needed to decorate our department now than if money had been available in the first stages of construction. Time-saving equipment such as elevators, dumbwaiters, and pneumatic tubes are highly desirable. However, in hospitals in which supplies are requisitioned frequently, it may be necessary to supplement these methods by mechanical delivery service. With such a supplementary system, a truck would furnish supplies for a certain number of hours, and supplies would be replenished on wards at certain times during the day.

A good system of controls, vested in the supervisor, would be essential in such a program.

Considerable savings can be effected by the use of mechanical equipment like glove processing, needle cleaning, and sharpening units. A larger number of syringes, gloves, and other supplies must be kept on hand if these machines are used, but costs are still less.

Economy alone does not always pay. It must be linked with efficiency and safety for the patient.

In-Service Program Aids CSR Efficiency

By Elizabeth Ouderkirk, R.N.
Central Supply Supervisor
General Rose Memorial Hospital
Denver, Colo.

EFFICIENCY IN OUR central supply department is greatly aided by our in-service training program, which features regular morning conferences, and our well-organized program for using volunteer help in making and wrapping dressings and other supplies for the department.

The need for organized training of central supply personnel was a problem because of limited time. We have solved this problem by having early morning classes and discussions, corresponding to morning conferences on the floors. We allow not over 30 minutes for these conferences.

The conferences are fulfilling the following purposes:

(1) They facilitate closer relationship of central supply to the floors and other departments, by discussion of problems pertaining to central supply and instruction in the use of supplies and equipment.

(2) Interest of central supply personnel is maintained by discussion of interesting subjects and new equipment, even though some of the equipment may not be in the department.

(3) Efficiency is increased. The employees have an opportunity to suggest procedures which are more economical, faster, and better. This promotes pride in the department.

(4) Time is devoted to bringing up problems, which can be settled by discussion.

(5) Accuracy is improved. Discussion of the trays used with each treatment tends to promote accuracy, eliminating errors before they happen.

(6) Punctuality is improved. Tardiness is magnified when a meeting is disrupted by someone coming in late.

When new employees come to the department they are given two weeks' orientation, regardless of previous experience. In this period they are performing assignments under supervision. Consequently, no shortage of help is felt.

Each employee is supplied with a mimeographed notebook of general information on central supply and sterilization. We also have the usual procedure cards, as well as scrapbooks of supplies found in the central supply department.

Since it is impossible for every employee to be present at the morning conference, a record is kept of the discussion, so that absent personnel may be kept informed.

Teaching aids used include demonstrations, blackboard, textbooks, magazines, pamphlets, catalogs. Movies are a good possibility. As increased interest is shown, more movies on this subject can be made available.

Our conference is conducted in the following manner:

The aides assemble informally at 7:30 a.m. The topic for discussion is written on the blackboard in outline form. The following is an example.

(1) Spinal tray; may be requested as lumbar puncture tray.
(2) Supplies needed.
  a. Kardex
(3) Supplies issued with tray.
  a. Gloves
  b. Monometer
  c. Prep tray (Kardex)
(4) Use.
  a. Diagnosis
  b. X-Ray
  c. Anesthesia

Precautions discussed.

(1) Need to test needles for strength, cleanliness, sharpness, and matching stylets.

(2) What may occur if tray is incomplete.

(3) Need to insure sterility of tray issued.

The tray is opened and the following steps are demonstrated:

(1) Contents
(2) Placement of supplies in tray
(3) Desirability of uniformity
(4) How the tray is used in the treatment
(5) Wrapping
(6) Sterilizing
(7) Cost of supplies to the department.

A question period follows the demonstration. Classes are conducted by the supervisor in such a way that as much as possible can be discussed in a short period of time.

The topics for discussion may be on any subject pertaining to central supply. Examples are sterilization, rubber supplies, dressings, solutions, equipment, or sterile technic on using an operating room pack. In this way the aide can visualize how the packs they wrap are used and why articles must be put in the pack in a definite manner. When there is not time for lengthy discussion, topics such as detergents, or types of needles and uses, may be discussed.

We have rotation of duties for the following reasons:

(1) Each aide will then be able to assume any assignment necessary, eliminating confusion if someone is absent.

(2) Difficult and easy assignments are thus distributed so that one person will not always have the hard assignment.

(3) Cooperation is stimulated when everyone knows the work involved in other people's assignments, and workers are more willing to volunteer help when possible.

(4) Jealousy, discontentment, and boredom are thwarted.

(5) It is each person's natural desire to learn, and rotation fulfills this need.

USE OF VOLUNTEER HELP

It is difficult to make and wrap some types of dressings in the central supply because:

(1) Employees tend to slow down, not producing enough of the product in the allotted time.

(2) There is not enough time for them to be detailed and uniform in the wrapping and making of the product.

(3) It is difficult to find personnel who are not busy, who can spend time in making dressings.

I believe in commercial packaging as much as possible, but this method does not completely fulfill the need.

Therefore it is of great help to have auxiliary help in meeting this need. I have found matrons of greatest value. They have fewer demands on their time; have great patience in making supplies uniform, and are consistent in attending meetings. One can definitely plan on a certain amount of usable supplies being made.

At our hospital a group of church women formed their own auxiliary. They have their own officers who keep track of time spent in making supplies and the quantity made. This takes a load from the central supply supervisor's mind. All the supervisor has to do is demonstrate how the new supplies are made and give the group a weekly list of supplies needed. Since this group attends meetings regularly, it is not necessary to spend much time with them.

SAMPLE BOX KEPT

In order to keep production going when the chairman is away, which is rarely, a sample box is kept. On a 5 x 8 inch Kardex card the name of the dressing and simple instructions are written. The dressing described is pinned with a safty pin to the Kardex so that the dressing may be removed for examination. If the workers have not made a dressing for some time, looking at the dressing is usually sufficient to refresh their memories.

One group with which I was associated demonstrated the dressings they made in the church class rooms, which stimulated the members in their hospital. Some of the members of this particular auxiliary had been members for over 15 years. The hospital showed its appreciation for their services by awarding pins with bars added for number of hours donated.

Our auxiliary will work wherever there is a place available—sometimes in a recreation area, sometimes in the storeroom. It is better if they do not work in the central supply department, for they would rather do this work as a group in their own way, and they do not interfere with central supply routine. These ladies meet once a week, and are served refreshments by the dietary department. The attendance is from 15 to 30 members. There is no need to worry that there will not be enough members; in fact it is necessary to limit attendance. Our auxiliary has a standing list of ladies wishing to join in the work.

There is no limit to the supplies they will make if shown how. Some of the things they do are:

Make paper wrap 4 x 4 dressings
Make 4 x 4 and 4 x 8 dressings, if necessary
Make paper wrap abdominal dressings
Make paper wrap Kerlix rolls
Make fluffs and package
Package tongue blades and applicators in glassine bags
Cut and roll bias stockinet
Package peri-pads for central supply and individually packaged peri-pads and cotton balls for maternity
Make tonsil sponges
Tie strings in tonsil sponges
Make premature baby jackets
Make sheet wadding rolls
Cut and package cellu-pads
Count sponges in packages of 10 and tie with string for the operating room
Roll packing into individual packs
Make special applicators and dressings
Fold dressing papers
Cut rubber bands from old rubber gloves.

It would be necessary to add at least two aides to central supply personnel in order to accomplish the amount of work these ladies do in one afternoon, and I am sure the end product would not be as uniform.

We greatly appreciate this volun-

Mrs. Ouderkirk (at blackboard) at typical morning conference. Subject for discussion was the spinal tray.

teer help, not only for the amount of supplies but for the absence of confusion and inconvenience to the routine of central supply.

POST O.R. SCHEDULE

Another thing we do in our central supply department to make things run more smoothly is the daily posting of the operating room schedule. A mimeographed copy of the operating room schedule, without the patients' names, is delivered to central supply and posted on the bulletin board. With this information, special supplies needed for certain types of cases can be prepared ahead of time.

We also use a simple method of culturing our supplies. Our pathologist has developed a technic of making a culture of Bacillus Subtillus and inoculating cotton plegets, drying them, and placing them in glassine bags. In this way, cultures are available at all times. A supply of the cultures is kept in the laboratory to run as a control. By placing a culture in a package and marking the outside for my detection, I am able to check the packaging, loading, and operation of the autoclaves by central supply personnel. This method has proved satisfactory and very convenient.

In our central supply department we do all the bedside units. The unit consists of a wash basin, emesis basin, water pitcher, disposable cup, soap, Dermafresh, package of 10 flexible straws, and a package of tissue wipes. Units are packaged in No. 50 shopping bags and stapled. The bedpan is laid on top of the package. Housekeeping takes the units to the patients' rooms.

When a patient is discharged, housekeeping strips the room and washes the utensils. Central supply picks up supplies which have been washed, from the utility rooms. The pickups are made three times a day. After sterilizing the utensils they are packaged and taken to housekeeping.

Our hospital is 200-bed capacity, and we have 50 units more than bed capacity. There is a cupboard on each floor for storing extra units. This method seems to work satisfactorily.

Installing a Central Supply Control System

By Matthew J. Ustas
Administrator, Presque Isle (Me.) General Hospital
Former Supervisor, Central Supply Room,
Lynn (Mass.) Hospital

When I assumed the position of supervisor of the central supply room of Lynn Hospital, I discovered many deficiencies in this phase of hospital management. Very little attention had been given to actual workable systems and methods of record keeping.

Before I was called in to reorganize the central supply room, the hospital had been seriously considering going back to the old system of preparing all supplies on the wards. Control seemed much too difficult, and complaints from the nurses and staff too numerous.

In an effort to solve the problem, I spent considerable time visiting central supply rooms in other local hospitals to gather ideas. I talked with administrators, supervisors, and nurses, reviewed my notes in courses on business administration, and through trial and error came up with the system subsequently put into effect.

Standardization of hospital accounting systems has become imperative in Massachusetts because of controversies over reimbursable cost formulae presented to the legislature in an effort to obtain reimbursement on government responsibilities at cost. Many hospitals are not prepared to meet this requirement, and this has resulted in great confusion. It is not beyond the realm of probability that because of third party payments (Blue Cross and Blue Shield, governmental reimbursement, and other similar plans) all states will require more accurate accounting of expenditures of hospital funds. This will include monies spent by the central supply room before increases in payments to hospitals are approved.

The central supply room is a rapidly growing addition to hospital administration and by merit will receive more and more attention in the future. A relatively standardized system of records will enable central supply rooms to compare results and efficiency.

Lynn Hospital's administrator is a progressive, farsighted director. He gave me a free hand, enabling our central supply room to be expanded to include a large range of activities. It handles all oxygen and orthopedic equipment and operating room gloves in addition to trays, needles, and solutions. This necessitates considerable bookkeeping.

Experience has made it evident that any department will do better if it has an adequate number of records to show who has what, what to anticipate in regard to supplies, and figures with which it is possible to go before the administration to justify changes and the need for new equipment.

At the time I left the hospital, our staff consisted of two graduate nurses, three orderlies, nine aides, and one part-time worker. By careful planning and reorganization of methods, through time studies and work simplification (and the expenditure of approximately $15,000) we changed our central supply room to a modern efficient department. This year this expanded department was scheduled to spend at least $75,000 in rendering valuable service to the hospital and the patient.

WHAT DO WE MEAN BY CONTROL?

Control is a system of checking or regulating the flow of items. It results in a standard for comparison and serves as a means of verification. We use records to obtain our control. They may vary as the situation demands, but they should be easy to maintain, simple, and kept at a minimum.

The daily check-in and check-out form used is the daily requisition. At the top of the form are the following blanks to be filled in:

CHARGE TO. Here the name of the department or the unit is entered. This shows the unit being served and to whom losses are to be charged. If any questions come up at a later time, records can be brought out and checked. If large breakage occurs, these records determine the amount of activity that took place in any particular unit.

CENSUS. Wards, particularly the service wards, at times have an abnormal census. If this is reported, leeway may be given to fit the situation. If stocks do run low, it may be necessary to pro-rate the supplies in accordance with the census.

ORDERED BY. It is better to have the name, not the initials, as it makes for easier location of the individual. At times it is necessary to re-educate individuals in the amounts of supplies to order.

RECEIVED BY. This section is signed only on the first and initial order of the day, which generally is the largest for the 24-hour period. It helps to assure the wards that they are getting what they ordered, as they are expected to check the supplies received before signing. During the remainder of the 24 hours the units are on an exchange basis.

DATE. This requisition is kept for a 24-hour period. Because all entries are in pencil, employees can make erasures and enter new totals. Thus the need for a new form each time new issues are made is eliminated.

At the left of the page, below these blanks, are three columns headed as follows:

ON HAND. This column is used chiefly for our open wards. These wards are not on a standard level of sup-

plies. They present the problem of sudden jumps in census. They are often overcrowded, and have insufficient space to store an adequate amount of supplies.

WANTED. The wards estimate their needs until the next exchange takes place.

RETURNED. Here is recorded what is actually returned. In a right-hand column near the bottom is a notice that sterile supplies are to be returned from 7-9 a.m. and from 2:30-8:30 p.m. We have two main exchanges that take place during these hours. The 7-9 a.m. exchange clears up all supplies used during the night and prepares an adequate level of supplies for morning treatments and doctors' rounds. We have found over a long period of time that our greatest amount of supplies are issued during this period. The 2:30-8:30 p.m. exchange clears up the morning supplies and gives the units an adequate level for the evening and night shifts. This six-hour period permits the wards to come down at their convenience, with consideration for change of shifts, reports, suppers for the patients, etc.

As supplies are ordered throughout the 24-hour period, the figures are erased and new figures added, so that one glance can reveal a total of supplies returned and issued. The central supply personnel handle these figures. They check the supplies in and check out at the appropriate windows.

It is important that a graduate nurse from the central supply room make frequent checks of the wards to encourage conformance to these regulations.

For open wards we have a running total from day to day. We take the previous day's "On Hand" total, add to that the "Wanted" total and subtract the "Returned" total. This figure gives us the amount with which we start the new day and put in the correct "On Hand" column. Inventories are done from time to time, and the actual inventory figures are used on a fresh requisition.

Realizing that several types of forms are used, and that there is a continual turnover of personnel, we have tried to put as much information on this slip as possible. The bulk of the right-hand column is not used for anything but reference. It shows the units, equipment available in the central supply room, and how to obtain it.

Charge slips are used for items we consider critical or non-routine. They are listed in the upper right-hand block on the daily requisition. We also use this method for control of our 10, 20, 30, and 50 cc syringes. Each one of these items has a separate place in a Kardex file. To obtain any of these, a small pink charge slip is submitted in duplicate with the date, ward, and type of set required, and the signature of the individual taking the item. The original slip remains in the central supply room in the proper file. The duplicate goes with the item and is returned with it.

If CSR personnel do not have time to check it at the time it is received, the slip serves to identify the unit returning the item when it is finally checked. Any damage or loss is noted on this slip, and both copies are placed on the supervisor's desk. The supervisor checks the notation and calls the responsible unit. Only then are charges made against the unit. If everything is in order, both copies are destroyed.

This system permits the supervisor, at intervals, to pull out the Kardex file and check the shelves. Each item is arranged on the shelves and placed in the same order as it is listed in the Kardex. Any discrepancy is noted, and a search is made throughout the hospital. Our CSR orderlies are notified, and they frequently find items. When a missing item is found, an investigation is made as to how the item was removed from the CSR, and steps are taken to prevent a recurrence.

Miscellaneous medical and surgical slips are made out for items chargeable to the patient and equipment for which there is a deposit or rental fee. These items are listed in the middle block in the right-hand column of the daily requisition. These slips conform to the size used by other departments so that they can be used in the accounting office machines. The patient's name is required, and the slips are submitted in duplicate. The original goes to the accounting office, so that if inquiries are made about the hospital bill, the original can be used to explain the charges. The duplicate remains in the central supply room and is used as a basis for arriving at totals of these items dispensed. These slips are totaled monthly Slips are kept one year and discarded.

WARD STANDARD

At times we got inquiries on how to determine a ward standard. The method may vary. However, if the wards are the same, one standard will do for all. Such was not our case. Lynn Hospital is the largest private hospital in an industrial city which has no city hospital. It has a combination of open and private wards which vary in size. Therefore, we had to set a standard for each ward. The method established is as follows: A daily total is obtained for 60 days, starting on any given day or at the beginning of a busy season. At the end of this period the high, low, and average number of each item used over each 24-hour period and the average census are noted.

Results are shown to each head nurse concerned. Remembering that each unit has at least two or more opportunities to exchange items, the personnel settle on the average, plus 50 percent as a standard for each item. Any partial number is rounded off to a full number.

All the items in the left-hand column are not on ward standards—only those which we felt the daily turnover justified. The objective of this system was to have an adequate supply of these items on hand and to eliminate paper work on those items used most frequently.

DAILY WORK SHEET

This sheet is used to determine the amount of work done by each shift in the central supply room. The central supply room is open 16 hours a day, seven days a week. The goal is a 24-hour service. We found it easier for each shift to total its work and record it before going off duty than to try to obtain such figures from a check-in and check-out sheet. It has a good morale effect on the personnel and serves to keep both the day and evening divisions in a sort of check-on-each-other attitude. These sheets are totaled weekly, monthly, and annually. It is used as a basis for future requisitioning and to anticipate our needs in our future expansion.

CSR DAILY COUNT

This form is the result of long hours spent in totaling all charges assessed against patients. Some of these records may not be deemed necessary by many hospitals. However we found the daily count essential when all parenteral solutions, which are stock-purchased, along with rubber goods, were transferred from pharmacy control to central supply room control and new problems were added to those we already had. This change had been contemplated for some time. Finally, after careful consideration, the administration concluded that as an aid in conforming with new state recommendations, the change should be made.

The additional work load was tremendous, the department uses about 25,000 units of parenteral solutions annually. It issues, controls, and assesses charges for about 110 No. 18 sterile Foley catheters alone, each month. The original charge slip, because of the need of pricing and adding to the patient's bill, has to go to the accounting office as soon as possible. These are cleared through central supply at least twice a day.

The duplicates, which are used for reference and totaling, seem to have a bad habit of piling up. To avoid this, when time permits, the duplicates are counted, the total recorded from the daily count form, and the duplicates filed. It is far easier to add the totals of the daily count than count all the duplicate slips at the end of the month. To arrive at the month's charges, assessed to the patients, the total number of each item used is multiplied by the price of that particular item.

A few other items were added to the list of articles dispensed. These monthly totals are added to the permanent records and serve as a guide for future ordering. Solutions are ordered quarterly to take advantage of financial savings as a result of less handling.

OXYGEN

Many hospitals have oxygen equipment issued from central supply. The central supply room at Lynn Hospital is responsible for the ordering, control, initial delivery, and setting up of equipment on the wards, plus the assessment of charges for oxygen. Frequently, the department is called upon for instruction in oxygen therapy. From 10 to 20 tanks are used each day, and on week-ends as many as 60 tanks have been dispensed. The whereabouts of each tent, mask, and gauge throughout the entire hospital, not to mention annual inventories of such equipment, was a big problem. The following system finally was adopted:

All oxygen is dispensed by the central supply room orderlies between 7 a.m. and 11 p.m. They help in no small measure to keep oxygen under control. Each tank or piece of equipment requires submission of a small green slip, "Request for Oxygen." An order may be given by telephone, but when the order is delivered a slip must be handed to the orderly.

A long green oxygen charge slip is made out in the central supply and then sent to the accounting office. A small green slip is then filed under the heading of tent, mask, catheter, or incubator, in the active oxygen file. As a repeat of oxygen on the same patient is received, the long slips go to the accounting office, and the small slips are clipped together, the latest date on top.

When oxygen is being returned, a small blue slip is submitted. This slip is clipped to the other "Request for Oxygen" slips, pulled from the active oxygen file, and placed in the monthly oxygen file. A long blue credit slip is sent to the accounting office. If all oxygen tents are in use when a request is made, the file is referred to, and the one with the oldest date on top is called for release. If for any reason there has not been any refill for a 24-hour period, there is generally no trouble in substituting a mask for a tent. The monthly oxygen file is cleared at the end of each month, and the amount of charges recorded in our permanent records.

Each major piece of equipment, such as tent and gauges, has a separate place and serial number in the Kardex file. In the event of repair, a blue tab is placed in the file and dated. After the equipment is repaired and returned, the blue tab is removed and the date recorded. Thus, there is a record of repairs on each item.

BREAKAGE

All equipment as it is returned is carefully checked, and shortages and breakages are noted on small pink charge slips which show the date, ward, and item. These slips are placed in a breakage box which is emptied from time to time, and information obtained recorded on a 5x8 card.

Each ward has a separate file card for each month. The pink slips are sent to the assistant administrator's office for checking. He in turn sends them to the storeroom. The storeroom uses them as a basis for replacing these items to the central supply room. The supervisor notes "Received" and signs.

C.S.R. DAILY COUNT

Date_____

5% D/W 1,000 c.c.
500 c.c.
5% D/S 1,000 c.c.
500 c.c.
Normal Saline Solution 1,000 c.c.
500 c.c.
250 c.c.
10% D/W 1,000 c.c.
500 c.c.
10% D/S 1,000 c.c.
Dextrose 5%, Alcohol 5% in Water
2½% D/W 1,000 c.c.
500 c.c.
Ringers Solution 1,000 c.c.
500 c.c.
Lactated Ringers Solution 1,000 c.c.
1/6 Molar Sodium Lactate
20% D/W
Sodium Chloride 5%
Electrolyte Solution D 1,000 c.c.
Electrolyte Solution G 1,000 c.c.
Amigen 1,000 c.c.
500 c.c.
Solution potassium and sodium chlorides with sodium Lactate 500 c.c.
DECILTERS 2½% Dextrose in Hypotonic Sodium Chloride
Misc. Buck's Extensions
Levine Tubes
Harris Tubes
Crutches Reg.
Special
Pads
Canes
2 x 2 spgs.
4 x 4 spgs.
8 x 4 spgs.
Abd. pads
Foley Catheters
Catheters
Misc.

The same original slip is then kept by the storeroom as a voucher for basis of supplies issued. Thus a minimum of forms is required.

CHARGE SLIP	STOREROOM
Made out at the time of checking	For issue
BREAKAGE BOX	CSR
Recorded on 5x8 CSR file card	Initialed
ASS'T ADM	STOREROOM
Checked	Voucher

The 5x8 file card is cleared at the end of each month and totalled, and a copy of such information, in detail, is sent to the nursing school office for its information. Total charges are entered in permanent records. The 5x8 cards are kept for the balance of the calender year and then destroyed.

It was our experience that a system using a number of bound notebooks is hard to follow. The Kardex system is used as much as possible, and each item is given a separate space. A slip, made out when an item is desired, notes the whereabouts of that item when inserted in the proper place in the file. To locate items the file is referred to. The slip is pulled when the item is checked or returned, and notations can be made on it.

Only one permanent book is kept. Entries generally are made only once a month. The only items entered as they occur are those of an unusual nature, such as addition of major equipment, inauguration of new systems, trays, or procedures. This log plus the monthly information is the basis for our annual report.

The annual report is important because it gives administration a review in concrete figures of the year's activity and also offers an excellent opportunity for recommendations for both long- and short-range improvements. It can give the administrator facts and figures to support his request for new expenditures.

In a large number of letters received before a central supply room institute, several other methods, not heretofore listed, were mentioned. Briefly, they are as follows:

(1) File Card System for Each Item by Wards—"The card file system used at this hospital is made up from information received from issue and return slips. Cards are filed according to wards and special departments. Entries on the file cards are made daily and cover the previous 24-hour period. The information recorded on the file cards gives the date, name of the special tray, and type of equipment, such as oxygen tent and suction machine. The return slips are checked against the file card and, when the tray or equipment is returned, the item is crossed off and dated with a red pencil.

"The use of the card file system takes longer. However, the method has proved satisfactory from a general administrative point of view, as it gives an accurate, concise account of items drawn and returned to the central supply room and a current record of the location of all supplies and items of equipment in custody of central supply."

(2) Equipment Board—"Equipment board, 30x30" blocked off in squares; each block labeled with one item, such as oxygen analyzer, cast dryer, nerve block set, fracture bed, etc. Each block has a hook on which a tag can be placed indicating the room number and date on which the article was given out. Tags are removed when the article is returned.

"Expendable stock is controlled by a weekly inventory which is based on minimum-maximum amount of supplies to meet the demand. Demand regulates change in minimum-maximum supply to be kept on hand."

(3) Master Peg Board

(4) Individual Slips (in Triplicate) for Every Item—"In central supply the 'check-in and check-out' is handled in this manner: The request for an item goes to central supply in triplicate. The original is sent to the cashier as the patient's charge; the second copy is retained in central supply as a record of where the specific item has gone, and the third copy is returned to the nursing unit with the item requested. This third copy is retained on the ward and returned to central supply at the time that the item is returned."

The duplicate or triplicate charge slips and the even-exchange systems are the most universal methods of control used. These systems, plus the file card and equipment board type of control, could work very well in small hospitals, but the picture would become more and more complicated as the size of the hospital and the number of items dispensed by the central supply room increased.

The central supply room supervisor cannot be expected, except in small hospitals, to run more than one department.

Time for study, research, and visits to other comparable departments in her area should be expected. This department is growing too fast to deny a good capable individual these opportunities. The result will be economy and efficiency realized by both the hospital and the patient.

Planning a Central Supply

Louise H. Streb, Assistant Director of Nursing, Bethesda Hospital, Cincinnati—Through the efforts and support of the hospital superintendent, we began our plans with a central supply committee, including representatives from the hospital administration, nursing administration, the operating room, medical-surgical and obstetrical departments, and the instructor of nursing from the nursing school. This committee was to bring recommendations to the hospital superintendent regarding: (1) services to be provided by central supply; (2) methods of supplying them; (3) facilities needed.

To determine what services should be provided, we decided first to visit central supply departments in hospitals which had efficiently functioning departments. To get comparable information in all hospitals visited, we made out a questionnaire to be used by all visiting groups. We collected the following information: number of beds, hours the central supply department was open, personnel—number and type; students, list of supplies and equipment handled, type of distribution service, and methods of requisitioning and charging for articles.

Our reports and recommendations were brought to the committee, which compiled a list of services to be done by central supply in our situation.

For help in working out details of trays, packs, dressing cart, and other articles and equipment which would remain on each nursing unit, we organized a central supply nursing committee composed of nurses representing most of the nursing units. As this committee's work progressed, we found the need for standardization of such articles as needles, dressings, etc., and another subcommittee was formed to standardize supplies.

To decide how services would be supplied, we studied the functions of related departments, like nursing, laundry, operating room, purchasing, storeroom, etc., and worked out plans for them to work with central supply. We discussed rebuilding our elevators, the advantages of messenger-pickup and delivery service, the use of the dummy elevators, and the intercom communication system between the central supply units.

By the time we knew what facilities would be needed, a registered nurse had been appointed central supply supervisor, and she became chairman of the facilities committee. Many details of type and number of cabinets, work space in tables and counters, arrangement of work flow, and equipment needed were worked out in committee discussions.

Our next step was to set up a functioning central supply. A tentative time schedule was set, taking into consideration time needed for remodeling the space, installing fixtures and equipment, and hiring personnel. From the reports and recommendations from our hospital visits, we decided upon the number and kind of personnel needed, the hours central supply would be open, and details of operation upon opening.

A manual, containing regulations, an alphabetical list of all supplies and equipment, tray and pack setups, and a list of parenteral solutions, was compiled by the central supply committee. The plan was to have central supply take over care of one nursing unit at a time.

After details of planning were completed, the initial central supply committee was discontinued, and an advisory committee to the central supply supervisor was appointed.

ANALYSIS

The plans worked out very well, until we came to the actual opening of the department. We did not know of the relationship of the steam pipes, and a rerouting of steam was required, so that all the autoclaves had to be changed from the operating room to central supply.

Central supply was required to take over all the nursing units and the sterilizing for the operating room. Central supply and operating room personnel were not ready for this drastic change, and some friction developed. Perhaps this points to a need for a public relations program if any drastic change occurs in institutional functioning.

Getting and keeping the agreed standard type and number of personnel was difficult. A better planned on-the-job training program and definite job descriptions are helping to solve these problems.

To improve interdepartmental relationships, department head meetings with the superintendent are held weekly. Supervisors from all departments meet in an annual seminar on pertinent problems. A monthly film program for all employees has been instituted.

Even though, after a year and a half of operation, our department is not functioning perfectly, we have found it more economical and efficient than our previous method.

(Abstract of a paper presented at the annual convention of the Ohio Hospital Association, Cincinnati, March 7-10, 1955.)

How Central Supply Functions at Denver General*

By Carol Larson
Supervisor, Central Supply
Denver (Colo.) General Hospital

● Patient areas at Denver General Hospital are located in three buildings which are connected by tunnels. The surgical and medical buildings are on opposite corners of one block and the pediatric building is located in the middle of the block.

The central supply service is located in the basement of the surgical building. Hospital units served are as follows:

1. Medical. This unit includes a tuberculosis ward, a psychiatric ward, a women's medical ward, and two men's medical wards.

2. Surgical. Included here are four surgical wards, an operating room suite, a recovery room, and an anesthetic department.

3. Pediatric and Obstetrical. There are two pediatric wards, an obstetrical ward, an O.B. nursery, and a delivery suite.

4. Other hospital areas served include emergency room, personnel clinic, outpatient department, general medical clinic, x-ray department, and medical laboratory.

Areas served outside the hospital are a Visiting Nurse Service, Tuberculosis Control Clinic, fire and police departments, city and county jails, and Aid to the Needy Disabled.

The Department of Health and Hospitals of the City of Denver is comprised of three divisions — Denver General Hospital, Public Health and Preventive Medicine and Environmental Sanitation.

It was felt that centralization of supplies for all divisions would provide for better control of supplies and more economy in the use and preparation of supplies. Other city departments also use the hospital facilities.

A procedure book was set up for the procedures in central supply. It is used as a guide in teaching new personnel and practical nurse students.

Items Included in Trays for Ward Procedures

Trays and packs are set up as completely as possible so that a minimum of supplies need be gathered for treatments and procedures. All trays are set up to include materials for preparation of the skin if needed. Applicators or cotton balls with a hemostat are used.

A drape sheet is included in all trays used in procedures which require draping. One size drape sheet is used in all procedures.

Mended gloves are included in catheterization and douche trays since the size of the glove makes little difference in these procedures. Gloves are not included in other trays because the size of the glove needed would vary.

All trays used in procedures in which a local anesthetic is required are set up to include the needles and syringes needed. All trays used in procedures which require suturing are set up with cutting needles, silk suture, needle holder, tissue forceps and scissors.

Dressings are included in all trays used in procedures which require dressings. Sani sheets (rubberized felt sheeting) are used on catheterization, douche, enema, and gastric trays. They are washable and less expensive than disposable pads.

Tray Set-Ups

The items used on each tray and in packs are listed on a card in a Kardex file, with pictures attached. The nonprofessional personnel are taught to check the Kardex for each tray they assemble, regardless of how well they feel they know tray set-ups. Every tray is initialed by person assembling it so that errors can be checked and corrected.

All supples used in the operating room suite are processed in central supply with the exception of instruments.

OPERATING ROOM LAP PACK: Ordered as needed—Standard 6

1 Table cover		
1 Mayo table cover	3 Table covers	
3 Gowns		
1 medium	0	1 sterilization indicator
2 large	15 towels	
10 Lap sponges	2 Table covers	
	30 Raytec sponges	
	1 Dressing	

Inside wrapper—Table cover
Outside wrapper—50 x 64 pack wrapper
Label with pack name—O.R. and initial

All supplies used in the obstetrical department are processed in the central supply including instruments.

DELIVERY PACK: Standard 6

1 Sheet	1 Towel
2 Leggins	1 Gown
	1 Towel
	1 Gown
3 Sheets	
	1 Instrument Tray*
	8 Towels
1 Baby Blanket	2 Perineal pads

*Instrument Tray

2 Kelly hemostats	2 towel clips
4 Allis forceps	2 leg rings
1 uterine dressing forceps	2 lateral retractors
3 long ring forceps	2 Hasseltine cord clamps
1 sterilization indicator	2 22G spinal needles
1 10cc 3-ring syringe	1 vaginal packing
1 25G ⅝" needle	1 250cc cup
1 22G 1½" needle	1 test tube with cork
1 20G spinal needle	12 4 x 4 gauze sponges

Place instruments in the tray with handles in the same

*Edited by Margaret K. Schafer, R.N., nurse consultant, Division of Hospital Facilities, U. S. Public Health Service, Washington, D. C.

direction; check instrument tray with the Kardex; wrap in a 50 x 64 wrapper; label and initial.

All spinal trays, block trays, caudal trays, etc., used by the anesthesia department are processed in central supply. The spinal tray includes the following:

1 20G spinal needle	2 towels
1 22G spinal needle	4 cotton balls
1 22G 1½" needle	1 hemostat
1 25G ⅝" needle	1 ampule file
1 mixing needle	2 medicine glasses
1 Pitkin needle guide	1 5cc syringe
1 sterilization indicator	1 2cc syringe

Separate the syringes and protect them with gauze.

Laboratory Cart

A "lab" cart is set up for the laboratory medical technician for use when drawing bloods each morning. This cart includes all items necessary for collecting blood specimens. After the technician finishes drawing bloods each morning, he brings the cart to the central supply room where it is cleaned, checked and replenished.

The cart is then taken to the laboratory during the afternoon where the special laboratory tubes are added. The cart is kept in the laboratory until it is used the next morning.

Solutions

Intravenous solutions used are commercially prepared. Irrigating solutions are prepared and autoclaved in central supply. These are: (1) normal saline—1000cc and 2000cc flasks; and (2) distilled water—2000cc flasks.

Fluid Sets

Intravenous sets, transfusion sets, subcutaneous sets and donor sets are disposable.

Dressing Carts

The dressing carts used on the surgical wards are taken to central supply by ward personnel at 11 p.m. each night. Dressing baskets are placed on each ward for night use. The night aide or orderly in central supply cleans, checks and replenishes the dressing carts. The carts are returned by central supply at 6:30 a.m. each morning.

Cans and pans of supplies are used on the dressing carts rather than individual packs for changing dressings.

Gloves

All used rubber gloves are sent to central supply where they are put into mesh bags for washing. The laundry washes and dries the gloves. They are then air tested in central supply, put in plastic bags with powder and sent to the laundry for powdering.

The gloves are wrapped in muslin wrappers and sterilized in central supply. This process is satisfactory, but it is a time consuming procedure because of the trips to and from the laundry. A larger supply of gloves is necessary since the laundry does not work on week-ends and holidays.

Gloves with pin holes are mended with liquid glove patch and are used on catheterization and douche trays.

Oxygen Service

An orderly from central supply covers the oxygen service from 6:30 a.m. to 11:30 p.m. Ward orderlies change oxygen tanks as needed from 11:30 p.m. to 6:30 a.m.

The central supply orderly makes rounds twice daily to check on the emergency oxygen set-ups on each ward, the oxygen in use, and the suction machines. He is responsible for the maintenance of the oxygen equipment.

He is assigned other duties in central supply, in addition, and is responsible for delivering and picking up large pieces of equipment. All calls for the oxygen service are taken in central supply.

Needle and Syringe Standards

Each hospital ward has a standard of needles and syringes set up according to the patient census and the use of needles and syringes. This standard is flexible and can be changed by the head nurse on each ward as needed.

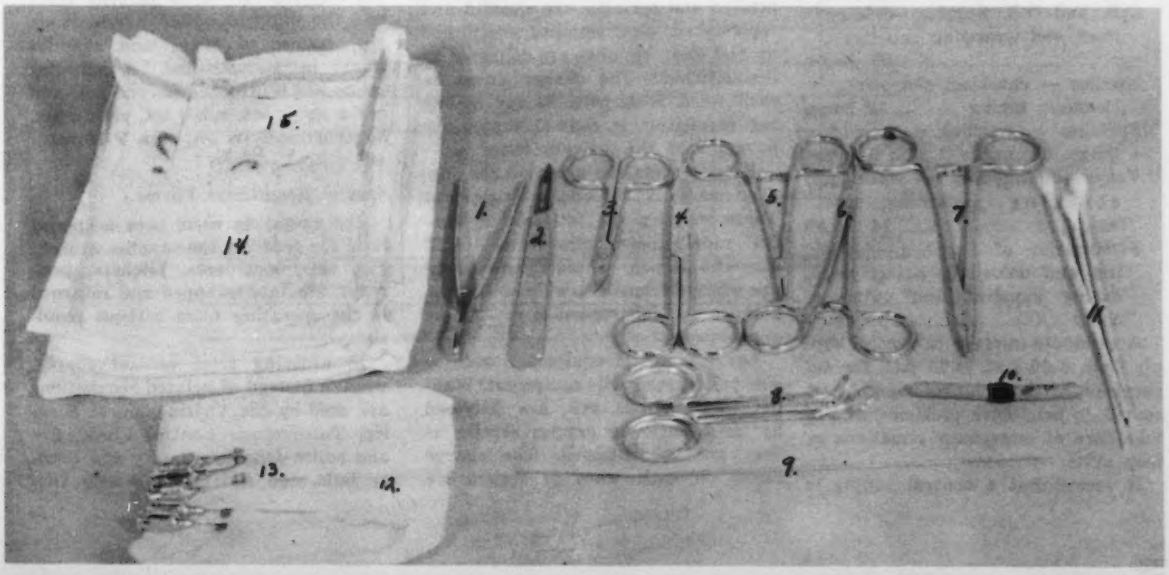
The central supply messenger carries sterile needles and syringes on her cart on the routine pickup and delivery service. The sterile needles and syringes on each ward are counted and enough sterile needles and syringes are left to meet the set standard. This system has insured the wards an adequate supply at all times.

Disposable Syringes

Disposable syringes have not been tried in the hospital. However, in the near future, the Visiting Nurse Service

The photograph below, taken from the Kardex file, shows the items needed to set up a cut-down tray. Listed below the photograph in the file is a key to the various numbered items, with instructiions for wrapping, and autoclaving, as follows:

1 tissue forceps without teeth (1)	1 needle holder (7)	5 Barber needles 20G, 19G, 18G, 17G, 16G (13)
1 scalpel with No. 11 blade (2)	2 small towel clips (8)	2 4 x 4 gauze sponges (14)
1 curved Iris scissors (3)	1 probe (9)	2 towels (15)
1 stitch scissors (4)	1 36" black silk suture (10)	Wrap in 27 inch wrapper. Label, number and initial. Autoclave 20 minutes.
1 curved mosquito hemostat (5)	3 applicators (11)	
1 straight mosquito hemostat (6)	3 small cutting needles (12)	



is planning a trial run with disposable syringes for penicillin.

Special Mechanical Equipment Used

Special mechanical equipment used includes a Vim Johnson syringe washer, a Casady needle cleaning machine, and a Tomac needle sharpener.

An expansion of the central supply department is planned for the near future. At that time we have requested a washing machine and glove conditioner for processing rubber gloves and a dishwasher for trays and basins.

Staff Coverage

The staff for a 40 hour week in central supply consists of one supervisor, one head nurse, two staff nurses, 19 aides and orderlies, and one ward clerk.

The daily coverage varies on weekdays and week ends. The average daily coverage consists of

	Mon.-Fri.	Sat., Sun., Holidays
6:30 a.m. to 3 p.m.		
Charge nurse	1	1
Ward clerk	1	0
Non-professional	9	6
2:30 p.m. to 11 p.m.		
Charge nurse	1	1
Non-professional	4	3
11 p.m. to 7 a.m.		
Non-professional	1	1

Because of the physical set up of the hospital and the messenger service offered, additional personnel are needed. An approximate time estimate for the various procedures, from 6:30 a.m. to 11 p.m., is:

Messenger Service—routine and special orders ..... 13 hours
Oxygen Service — checking and cleaning equipment, setting up new equipment, messenger service for large equipment, etc. .....16 hours
Gloves — testing, wrapping, and autoclaving .....7 hours
O.B. and O.R. Supplies—folding linen and wrapping supplies.... .....20 hours
Needles — checking, sharpening, cleaning, tubing .....12 hours
Syringes — washing and wrapping .....8 hours
Trays and Supplies — washing, checking, assembling, and wrapping .....14 hours
Sterilization of Supplies — loading and unloading autoclaves, dating supplies, and putting away .....14 hours

A graduate nurse is in central supply from 6:30 a.m. to 11 p.m. for supervision of the non-professional personnel, to help solve problems, and to take care of emergency situations as they arise.

It seems that a central supply is assumed to be the "supply house" of the hospital. One Sunday a central supply nurse reported that she had a request for a board 20 inches long and two inches wide. Not "Do you have?" but "Please send." An old broomstick was provided, and proved to be satisfactory. Incidents such as this improve relationships with ward personnel and are one justification for nurse coverage.

Hours

The central supply department begins the working day one-half hour earlier than the ward personnel. This practice was introduced to avoid central supply messengers spending time waiting for elevators between 7 a.m. and 8 a.m. when dietary, operating room, and housekeeping personnel are using the elevators. It has eliminated the time spent in waiting for elevators, and the extra half hour is helpful when there is a heavy work load.

Assignments

Assignments are made on a weekly basis and are assigned by job number. Assignments are written in detail on cards in a Kardex file, so that each aide and orderly knows and understands his or her responsibilities.

Assignments are rotated as much as possible, depending upon the capabilities of the aides and orderlies. Rotation of assignments creates more interest in central supply as a whole and makes it easier to make assignments during the time of vacancies and illnesses.

Receiving and Distributing Supplies

Because of the physical setup of the hospital, messenger service is used to deliver clean supplies and pick up used supplies. A pickup and delivery service is carried out three times daily—7 a.m., 1 p.m., and 8 p.m.

On these rounds the standards of needles and syringes are checked and replenished, used supplies are picked up and clean supplies are delivered as requisitioned. The charge nurse on each ward is responsible for having her requisition in central supply one hour before the delivery time.

Phone orders are accepted for supplies needed between delivery services. These supplies are delivered by central supply messengers between 6:30 a.m. and 11 p.m. There is no messenger service from 11 p.m. to 6:30 a.m. because the department is covered by one person at night.

Large pieces of equipment, such as side rails, orthopedic equipment, Wangensteen suctions, etc., are delivered by the orderly on oxygen service as they are requisitioned. The charge nurse on each ward is responsible for calling central supply when the equipment is no longer needed. The orderly on oxygen service is responsible for picking up this equipment.

Supplies used by the Visiting Nurse Service, Tuberculosis Control, and the Aid to Needy Disabled are delivered and picked up once daily by central supply messengers. These departments are located across the street from the hospital.

Requisition Forms

Printed requisitions are used in ordering supplies from central supply by the hospital wards. This form does not include all items stocked by central supply but is a list of the items which are ordered most frequently. The blank spaces under "Other Supplies Needed" are used to list items not on the requisition. A requisition is required for all items sent out from central supply.

The printed requisition was set up because we felt that the advantages outweighed the disadvantages. Disadvantages are cost of printing, and over-ordering of supplies.

Advantages for the hospital wards are:

1. A printed requisition would serve as a guide and reminder to the person ordering supplies.
2. Time would be saved in ordering supplies because it takes less time to write a number than a name.

Advantages for central supply are:

1. Time for messenger service would be reduced for "forgot to order" items.
2. Time would be saved in assembling ward orders because the requisitions are set up according to the shelf arrangement of supplies in central supply.
3. The printed requisition would avoid the abbreviations used in ordering supplies (i. e., 5 percent DW) and the difficult-to-read handwriting.
4. Names of trays and supplies would be standardized. A subcutaneous set is a subcutaneous set, and not a clysis set, sub-q set, sub-cu set, hyperdermoclysis set, or a V-16 vaco-set.

Special Requisition Forms

The operating room uses a special form for ordering the supplies needed. Pan sets, local sets, pitchers, prep trays, etc., are wrapped and returned to the operating room without requisitions.

In ordering from central supply, written instead of printed requisitions are used by the Visiting Nurse Service, Tuberculosis Control Clinic, fire and police department, city and county jails, and Aid to the Needy Dis-

abled. The supplies used by these organizations are special supplies used only by them.

After the supplies are delivered, the requisitions are returned to central supply and are discarded the following day.

Stock Inventory Cards

The stock inventory card file was set up for two purposes:

1. As an inventory for all supplies stocked in central supply.
2. As a guide to locate supplies stocked in central supply.

The file contains a card for each item stocked by central supply and is also cross-indexed with various names for the same tray (i. e., lumbar puncture or spinal tray).

The file also contains cards for items which have been requested from central supply but are stocked by other departments (i e., Procaine 1% —Obtained from pharmacy).

This file has been especially helpful for the practical nurse students, new personnel and for the non-professional worker on the night shift.

Control of Supplies

Only special trays and equipment are checked out by number because of the quantity of supplies used and the clerical time involved in keeping accurate records.

Three forms are used in the control of supplies and equipment. They are central supply requisition forms, inventory control card, and delivery check sheet.

The following system is used:

1. As special supplies and equipment are ordered, the person dispensing the item records the number on the requisition form.
2. Twice daily the ward clerk checks the requisitions and records the date, ward, and item number of the dispensed items on the inventory control card which is set up in a Kardex file.
3. Each morning the ward clerk checks the delivery check sheets for the items returned on the previous day, and records the date returned on the inventory control card.

By checking the inventory control card, the charge nurse in central supply can locate supplies quickly and can check on supplies which are not returned by the wards.

DEPARTMENT OF HEALTH AND HOSPITALS
Central Supply - Delivery Check Sheet

Ward_____ Date_____

Syringes:	Order	8 AM Count	1 PM Count	8 PM Count	Lab Basket
2 cc					
5 cc					
10 cc					
20 cc					
50 cc					
Insulin					
Tuberculin					
Needles:					
#25					
#22					
#20					
#19					
#18					
Short #22					
#20					
Emergency Local					
Pick-up Forceps					

Items Returned	#	Items Returned	#

Work Simplification Applied to the Hospital

By Karl Linderoth
Methods Engineering Council
Pittsburgh, Pennsylvania

● Our subject is Work Simplification. We have divided it into two parts. I shall give you some of the background to Work Simplification; the philosophy and principles upon which it rests. Later, Miss Prickett will tell you just how Work Simplification applies to your particular field and what it can do for you in your work.

Methods, and the application of methods, are some of the most common occurrences in our daily life. But we generally give it little conscious thought. And why? Probably because the many methods we use in our daily, personal routine have become so obvious and natural that we do them automatically.

Such simple things as putting the sock on the foot before the shoe; putting the tablecloth on the table before you put the plates on; the logical sequence in preparing food; the planning of the shopping day; and hundreds of other examples demonstrate how we do things all the time according to a certain pattern, following some kind of system. If we didn't plan these things, plan methods for doing them, we would find it difficult to accomplish even the simplest thing. All this, you will say is nothing but common sense! And that is very true. And so it is with Work Simplification or Methods Engineering, as it is known in industry.

Someone has stated very aptly, that the art of methods engineering is nothing but common sense systematically applied. That does sound very simple, doesn't it? But unfortunately we are not as systematic as we think we are, or as we would like to be, in the application of the best method in our daily routine. The more we get used to a system or procedure the blinder we become, until circumstances make us experience personal discomforts or perhaps economic losses. Not until then do we look into the matter and take steps to correct the faults.

One of the basic principles of Work Simplification is to avoid this situation insofar as possible. In other words, make the change before we are forced to do so. Otherwise, it may be too late, or might have caused serious and unnecessary inconveniences. In order to comply with this principle, however, we must first know all the facts about the activity we wish to study, that is "make a diagnosis of the case." Then we need some kind of tools to measure the individual and collective effects of these facts.

The "diagnosis," or analysis and the tools, are known as Modern Management Technics. These technics are not devised overnight. In spite of the logic in doing things the best way and with the least expense, there was a time, and not too long ago, when very little scientific approach was made to management problems.

Today, we are all benefiting from these technics in one way or another. Without time and motion study, improved methods, and working conditions, wage incentives based on accurately determined time standards, etc., modern industry would never have reached its present efficiency and

HOSPITAL METHODS ANALYSIS SHEET
Methods Engineering Council
Pittsburgh

Date: _____ Department: _____

Procedure or task: _____

Classification of worker: _____

DETERMINE AND DESCRIBE	DETAILS OF ANALYSIS
1. PURPOSE OF PROCEDURE OR TASK	Why is the task performed? Can purpose be accomplished better otherwise?
2. COMPLETE LIST OF ALL STEPS IN THE PROCEDURE OR TASK: No. Description Work Station Dept. 1. _____ 2. _____ 3. _____ 4. _____ 5. _____ 6. _____ 7. _____ 8. _____ 9. _____ 10. _____	Can procedure being analyzed be eliminated? be combined with another? be performed during idle period of another? Is sequence of procedures or tasks best possible? Should procedure or task be done in another department to save cost or handling?
3. QUALITY REQUIREMENTS a. Of previous procedure or task b. Of this procedure or task c. Of next procedure or task	Are the requirements necessary? Why? too costly? suitable to purpose?
4. MATERIALS Supply materials	Consider size, suitability, ease of handling and condition. Can less expensive material be substituted?

production. This has led to a spectacular rise in the standard of living. This is particularly true in this country, where we are fortunate to live under a system which permits scientific management to be fully utilized.

It seems, therefore, fitting to say a few words about the pioneers in this field. Frederick W. Taylor, M.D., the father of scientific management, is the oldest among them. He laid the foundations for modern methods engineering, when he, more than 50 years ago, as a foreman of a department of the Midvale Steel Company came to the following conclusions:

1. That production was the foundation for material prosperity.
2. That the workers by no means produced as much as they could.
3. That greatest production results when each worker is given a definite task, to be performed in a definite time and in a definite manner.
4. That a system of rewards was necessary for the accomplishment of the established task. Thus the wage incentive was born.

Taylor stressed also the importance of methods in the achievement of higher production. Many of those who applied Taylor's procedures, however, tended to neglect the factor of method. The reason for this was the spectacular results in production from the introduction of incentive systems, which permitted a worker to earn according to his own volume of production.

FRANK GILBRETH

It became the lifework of another scientific management pioneer to bring methods back into the picture. His name is Frank B. Gilbreth. He is not only well known to us all, professionals and laymen alike, through the book "Cheaper by the Dozen," but also through his wife, Dr. Lillian M. Gilbreth, who courageously carried on her husband's work after his untimely death. She is today one of the outstanding inspiring personalities in the field of modern management and has personally contributed to the successful start of the present Hospital Scientific Management Project at the Medical Center of the University of Pittsburgh.

Frank Gilbreth's and his wife's contributions are particularly important in the field of motion studies. They developed the micromotion study procedure, based on Gilbreth's 18 basic elements of motions, which in varying sequence and with varying repetition occur in all manual or physical work, from the simplest to the most complex. This contribution of the Gilbreths made it possible to break down an operation into definite parts which would later be rearranged according to the principles of Motion Economy. The pattern followed by the motions in a procedure is what we call the method. The principles of motion economy determine which is the best method to use.

For some years the pro's and con's of Taylor's and Gilbreth's work were discussed by their many followers. They finally split into two groups. One was the time-study group, and the other was the motion-study group and neither could see eye to eye with the other.

SAME GOALS

However, as both groups learned more about each other's work and found that they actually were striving for the same goals and only used different language, differences were reconciled. As a result, the best features of both approaches were combined into a single, universally applicable procedure. This I have already referred to as common sense systematically applied, namely Methods Engineering or Work Simplification.

At this point, perhaps your reaction is, "What has all this to do with hospital work? It might be all right for industries that actually produce material goods, but in hospitals we deal with much more intangible things such as the health problems of the human being. Our work is too irrational due to unforeseen complications in the afflictions of the human body and mind. Our work is too different."

Perhaps I should console myself, rather than you, with the fact that such a reaction and the seemingly irrefutable arguments related to it are no different from those given at first, even today, by many people in industry. They soon change their minds, however. Modern management technics have received their due acceptance by all progressive leaders of industry. Wherever they are applied, they give highly satisfactory results.

Hospitals are by no means an exception to the applicability of these technics. This has been readily recognized by some modern hospital managements, who have already done much to improve working conditions for personnel and services to the patient, who is the most important beneficiary of all our efforts.

So that we may start from the same point or level of approach to the problem of methods improvement in hospitals, I wish to give you the definition of Methods Engineering:

> "Methods Engineering is the technic that subjects each operation of a given piece of work to close analysis in order to eliminate every unnecessary operation and in order to approach the quickest and best method of performing each necessary operation; it includes the *standardization of equipment, methods, and working conditions;* it trains the operator to follow the standard method. When all this has been done, and not before, it determines by accurate measurement the number of standard hours in which an operator working with standard performance can do the job; finally, it usually, although not necessarily, devises a plan for compensating labor which encourages the operator to attain or to surpass standard performance."

The key word in this definition is the word "analysis." The existing procedures must first be carefully analyzed before any attempt is made toward improvements. In other words, we must know all the facts, their relationship to each other, as well as the nature of these facts before we make any changes.

Consequently, our next question is, "How do we go about making this analysis of the facts? Where do we start, and what do we do with the findings?"

MAKE UP A CHART

Let us use a general hospital for an example. A good start is to make up a chart of its organizational structure, the departments, and services shown in their actual relation to each other indicating areas of responsibility and lines of authority. This is commonly called an Organization Chart. To the trained eye it will soon reveal any violations of organizational principles in the overall picture as easily as it may suggest apparent inadequacies within a department. We have thus the basic outline of the hospital showing its overall functions by departments, such as: Economic and clerical administration, medical service, surgical service, nursing service, supply and maintenance departments, etc.

One of these areas will undoubtedly have priority over the others as to the need for improvements in its operation. This need may range from floor plan layout to personnel super-

vision. Once the department or service to be studied has been established, we proceed to our next step, the analysis of facts about that department. This will in turn give us a clue as to what particular phase of the department's activities we should give our immediate attention.

This analysis can be made by direct observation of activities in the department in question, or we may take a motion picture of procedures.

The activities are then systematically arranged on a *Process Chart.* By doing this we get a complete picture of what goes on and, to a certain extent, just how things are done. In the second part of this discussion, Miss Prickett will demonstrate in full detail the use of such a process chart and explain what can be gained by its use.

It is usually possible to spot at once many weak points in a process or activity by analyzing a chart of this kind. Once again we determine which problem should receive our attention first, and then continue to break down the problem still further.

OPERATION ANALYSIS

This process is called Operation Analysis. Hospital Methods Analysis Sheet is a tool of analysis. Simply stated, we can say it is a guide to the systematic asking of pertinent questions about any task.

To make the sheet useful to persons in addition to the one who prepares it, it is important to carefully identify the study. Therefore, we begin by recording the date of the study, in what department it was made, the task we are studying, and finally who performed this task. We feel that the classification of the worker is more important than the name. One of the things we want to find out is how well qualified the worker is to do the task.

Now we come to the study proper.

As you can see, the sheet is divided in two columns. The left one is headed "Determine and Describe" and the right one "Details of Analysis." The left column lists all important considerations or steps of a task, while the right one suggests pointed questions to be asked in reference to these considerations and steps.

An operation analysis is made for the purpose of improving the method of doing the task. It might, therefore, seem that this point should be considered first. All of the other factors listed on the Analysis Sheet, however, influence the method directly or indirectly. Until they have been studied and improved as much as possible, it is inadvisable to begin a too detailed analysis of the method. In actual practice, it is seldom possible to complete the analysis of one factor at a time and then leave it for good. Several of the factors are interdependent, and a change in one may cause a change in others. However, the list indicates in a general way the course along which the analysis should proceed.

Typically, a methods analysis involves the nine points that are listed on your sheet. These points concern:

1. Purpose
2. Relation to other tasks
3. Quality
4. Material
5. Material Handling
6. Work Station and Equipment
7. Common Improvements
8. Working Conditions
9. Method

It is important that the Operation Analysis be made systematically so that all points are considered in the order of their relative importance and so that no possibility for improvement will be overlooked. At the same time, it is not necessary, even though desirable, that the analysis be made complete to the last detail for it to bring about worth-while results. The act of filling in the sheet causes one to look at a job in its details. A task is seen to be a *series of simple problems* instead of a single complex problem. The solutions to these problems are found to be comparatively simple when considered individually. In other words, the analytical approach is encouraged, and guidance is given through each step of the study.

AN EXAMPLE

Let us take an example with which you are all quite familiar, and quickly go through the first few steps of a methods analysis. Let us consider the task of processing used rubber gloves.

Question 1: What is the purpose of this task?

The first answer that comes to mind is: "To wash, dry, inspect, powder, sort, package, and sterilize the gloves to make them ready for use again."

We could stop there and start considering how each of these steps could best be performed. If we do, we are not looking deeply enough into the purpose of the task. Let us then ask another question: "Why are all these steps of washing, drying, inspecting, etc. the rubber gloves taken?" The answer to this question is: "To give the hands of the doctor, the nurse, or other person a sterile cover in order to protect the patient."

Now is the time to ask: "Is the task necessary?" "Of course," you would say, "it is vitally important to protect the patient from infections that may arise from, for instance, the contact of a bare hand with an open wound." All right, *but*, is it necessary to process the rubber gloves after use? Why not throw them away and use new ones? That would eliminate all the steps in the processing of gloves except possibly that of sterilizing them. "Too expensive," you will say. Well, perhaps we shouldn't use gloves at all, then. Perhaps we should focus our attention on finding a better way of giving the hands a sterile cover rather than trying to improve a poor, wasteful, or costly method? Perhaps we can develop some type of solution that will give the hands a sterile cover, and when this cover is no longer necessary, it can simply be washed off. Then we have eliminated the entire procedure of glove processing, and that would be the best work simplification of all.

This example demonstrates the probing kind of questioning that is necessary in operation analysis to make it most effective.

Again, remember, all of the factors which are considered during a methods analysis affect the method of performing the task. When all of the improvements uncovered during the analysis have been summarized and put into effect, the result is that the method has been improved to the extent that it can be improved by methods analysis alone.

We come now to the most detailed type of analysis of a procedure. It covers the study of the two dynamic elements of Motion and Time.

I have already referred to these elements in the brief review of Taylor's and Gilbreth's contributions to scientific management. Today we are fortunate to have at our disposal a much improved technic over the stop-watch or the exclusive use of therbligs (Gilbreth's name backwards, expressing his 18 basic elements). This is the more and more widely used "Methods-Time Measurement" technic. MTM, as it is commonly called, is best explained by its own definition, which says:

> "MTM is a procedure which analyzes any manual operation or method into the basic motions required to perform it and assigns to each motion a predetermined time standard which is determined by the nature of the motion and the conditions under which it is made."

APPLYING TECHNIC

By applying this technic we learn the facts about the ultimate physical components of the methods picture. From here on we can start to rearrange things for the purpose of arriving at a method which will give the best result, in a human as well as in a material sense, the best result with the least effort and expense.

Now someone might say, "Motions and method patterns cannot possibly be so important that it pays to go to these lengths and details in the studying of the possibilities for improvements in efficiency and economy in a hospital."

It pays indeed to be this methodical. Just think for a minute about your own work in making improvements in the activities under your supervision. You will find that you were most successful when you knew the facts. Then you were really able to simplify the work; get more done than before, and see happier faces around you. And what did you actually do? You eliminated unnecessary motions and impractical work patterns and perhaps improved the necessary motions. You did Work Simplification!

Motions and work patterns are ever present in everything we do; from plain walking to performing the most complicated task. It is important that we develop good methods of working so we conserve time and energy and thereby do a better job of caring for the patient.

I have briefly discussed with you the following tools of Methods Improvement:

1. Time Study
2. Motion Study
3. Process Charts
4. Operation Analysis
5. Methods Analysis
6. Methods-Time Measurement

These tools are of great value, particularly when combined with the key words in our earlier definition:

COMMON SENSE,

SYSTEMATICALLY APPLIED.

Work Simplification in Central Supply Service

By Edna A. Prickett, R.N., Assistant Professor
of Surgical Nursing, University of Pittsburgh

These technics have been largely responsible for the high standard of living that we enjoy in this country. They provide better and faster ways to produce the necessities of life, so that industry can spend more time in producing what other countries call luxuries, but which we look upon as every-day conveniences. The philosophy is simply applied — the faster we produce necessities, the more time we have for producing and enjoying conveniences and luxuries.

But just how can we apply this philosophy to hospital work? To state it simply: (1) By making better use of personnel, and (2) by finding better ways of doing things.

First, you must understand that we are not trying to put mass production into hospitals. Our main concern is still the care of the individual patient. However, the same technics are applicable to any work involving human activity.

TIME AND MOTION STUDY

The approach of motion and time study fits equally well when applied to factory work, a department store, housework, central supply service, or other work within a hospital.

What is accomplished by the work may vary considerably from one job to another, but human effort will still be composed of the same basic acts. We are not studying the product, but rather the motions that go into making or changing the product. We want to accomplish the task to be done with the least expenditure of time and human effort possible.

Central supply service, like every other hospital department, has been affected by the critical shortage of personnel and the increasing demands for service. Competition in the present-day labor market makes any appreciable increase in personnel difficult or even unlikely. Certainly there is no evidence of a decrease in the demands for medical service. However, we can use work simplification, which has been so successfully used in industries, as a means of increasing productivity through finding better ways of doing routine and repetitive jobs and using human effort more advantageously.

Central supply departments were introduced to hospital organizations some 25 or 30 years ago. Some hospitals still lack this service, and those existing vary considerably in size, equipment, and functional activities.

As the volume and variety of professional supplies and equipment have increased, central supply service has become recognized as one of the most important service departments in the institution. The present trend toward a higher degree of centralization shows promise in reducing the work load on the various departments requiring direct care to patients.

The "shorter stay" of patients and the continuous addition of hospital beds has caused the increase in hospital patients.

Medical science has made notable strides. The door has been opened to many patients who heretofore were considered helpless. Changes in the methods of treatment along with the many new procedures have added tremendously to both the volume and scope of functions placed on nursing service.

Likewise, the demands for professional supplies have increased in volume and variety. Consider what the introduction of the antibiotics, the increased use of parenteral fluids, the growth of the blood bank, and the use of intravenous anesthesia have meant to the hospital inventory of syringes and needles. It has been estimated that the inventory should allow for six needles per bed per day. In a 300-bed hospital, 1,800 needles must be ready for use daily.*

Statistics reveal more nurses in active nursing today than ever before, yet the supply does not begin to meet the demand. In addition, since all surveys indicate that the shortage will continue, it is necessary to consider other adjustments to meet the problem.

At the University of Pittsburgh, nurses are working with methods engineers to study ways of improving hospital methods and practices. The engineer does not do our thinking for us but rather guides our thinking in a field in which he is trained. We feel that by having a professional man guide our efforts rather than do the job himself, we will gain more because we will develop our own powers of reasoning along the lines of work simplification.

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We feel that it is technically sound and economically essential that there should be further reallocation of functions in order to extend the services of existing professional nurse power to provide maximum service to patients. Experience has shown that many time-consuming duties performed by professional nurses can now be safely and effectively performed by properly trained workers.

Reallocation of functions of the professional nurse does not necessarily mean an increase in non-professional personnel. Neither does it mean that we intend to "squeeze out" the very last "lick of work" from the auxiliary workers. The application of work simplification will increase production through finding better ways of doing routine and repetitive jobs.

Furthermore, we believe that more service — and more efficient service can be given to patients as well as to doctors by the centralization of all functional activities in the preparation and handling of professional supplies and equipment throughout the hospital. This of course, would extend the demands and further increase the load on central supply service. This department is actually a hospital "workshop." Since it does not give direct patient care, "assembly line" methods can be advantageously used.

The frequency of work, volume of work, amount of manual labor involved, and type of labor required, are all factors on which to base a decision of whether or not the technics of work simplification can be profitably applied. Such jobs as the processing of syringes, needles, gloves, treatment trays, and preparation of surgical dressings are areas which render themselves to detailed studies of methods improvement.

PROCESSING NEEDLES

Consider the all-important job of processing needles. This is a task that occurs daily. At present the volume is large. It ranges from 200 or 300 needles in the smaller hospital to 2,000 or 3,000 needles in the larger hospital. The labor may involve professional and non-professional personnel. The professional nurse is overqualified for the job and should be relieved of this task. It is also important to conserve the time spent by the non-professional help so they can take care of the increased load in other areas. If we reduce the processing time by one hour a day, we save approximately nine full 40-hour work weeks a year. Such a saving is easily within reach by substituting mechanical equipment wherever possible, and by simplifying and improving the manual work still involved. The care of the needles is not an isolated example. The same possibilities are open to other jobs with the same characteristics.

We have considered here only the time saved, not the savings made in dollars and cents by relieving the higher-paid professional nurse from the task and by conserving the time spent by the non-professional worker. The yearly savings realized in this way often more than cover the cost of any mechanical equipment introduced.

Chart I
Information Needed to Construct a Flow Process Chart

1. Scope of study — beginning and end points
2. Type of chart
3. Cost unit
4. Operations
   a. Operation name
   b. Quantity unit
   c. Operation time
   d. Work station
   e. Distance moved
5. Transportations
   a. Quantity unit
   b. Method
   c. Distance moved
   d. Transportation time
   e. Destination
6. Inspections
   a. Quantity Unit
   b. Inspection name
   c. Inspection time
   d. Work station
   e. Distance moved
7. Delays
   a. Reason
   b. Average time
8. Storages
   a. Place
   b. Average time

Even if you feel that your personnel are being used to the best advantage and if you are using mechanized equipment wherever possible, the principles of methods engineering can still help you.

Is your layout such that it allows for the best sequence of work; avoids back tracking; cuts down on the steps necessary between operations, and provides ease and comfort for the worker? A recent survey made in a hospital that had mechanized equipment for glove handling showed that much time and many steps were wasted between operations. The gloves were washed in the operating suite located on one floor; dried in central supply on another floor; sent back to the operating suite for inspection; up again to central supply for powdering and down once more to the operating room for packaging and sterilization.

Other questions to ask are these: Are materials stored as close as possible to the point of use? Are materials and equipment most frequently used located in the most accessible space? Are obsolete materials and equipment discarded, or do they still occupy valuable space? Are working conditions such that they allow for proper lighting and sufficient ventilation? Are work areas provided with best designed tables and chairs for alternate standing and sitting?

This is by no means a complete list of possibilities for work simplification, but it does indicate the general areas in which the principles and technics can be used to advantage in central supply service.

In order to help you better understand the application of method improvement technics, I will give you an example of how one of the technics was applied to a job—that of processing rubber gloves, which is a repetitive job in practically every hospital.

It is not uncommon to find this particular job performed in various areas such as the operating rooms, the birth rooms, out-patient departments, and even nursing units. This means that you have numerous individuals responsible for the task as well as various levels of workers performing it.

It is easy to understand why this is not economical from the standpoint of:

Equipment, because it means a complete set of equipment for each department processing gloves.

Space, which is certainly significant in most hospitals.

Personnel, because it means an increase in the number of workers trained to perform the procedure, and may also include the use of over-qualified workers.

For demonstration purposes we will use a flow process chart which is based on a method commonly used in hospitals. The flow process chart is a tool of analysis. You will see how it is applied to the problem of glove handling.

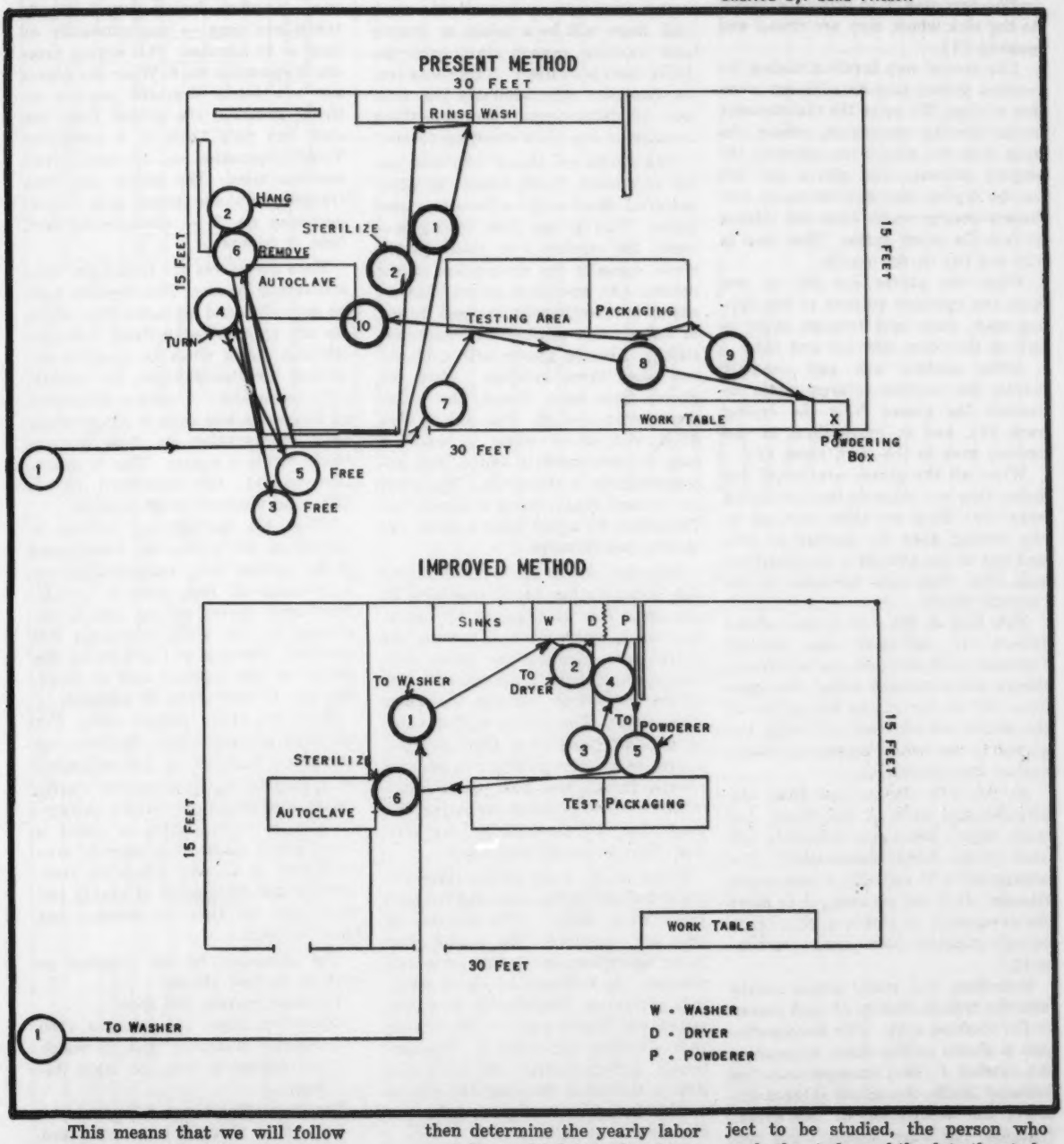
FLOW PROCESS CHART

Let us look at Chart I for the information needed to construct a flow process chart. The first three points on the chart concern the identification, and covers

1. Scope of the study — which, in this case, begins after the accumulation of used gloves and ends at the point where gloves are ready to be packaged for sterilization.
2. Type of chart, which, in this example, will be a material chart.

Flow Process Chart III

Subject charted: Processing used gloves
Charted by: Edna Prickett



This means that we will follow the material being processed rather than the operator doing the processing. It is important to decide at the outset of the study which type of chart is preferable in each case and then to remember to "stick" to that decision throughout the study.

3. The cost unit. In this example we have chosen 100 gloves. The cost unit could be anything, from one glove to perhaps 500 pairs. This unit will give us the cost of processing 100 gloves. We can then determine the yearly labor cost by multiplying the figure obtained by the yearly rate of production.

The following five points indicate the symbols and their meanings, as you can see on the upper right-hand side of the flow process chart (Chart II). The symbol for an operation is a circle. The symbol for a transportation is an arrow, and so on.

Let us now turn our full attention to the identification part of Chart II—upper left-hand side. It is important to identify all studies as to the subject to be studied, the person who made the study, and the date the study was made. On the front we usually have a sketch of the work place layout or part studied.

Chart III shows both the original and the improved layout. The purpose of the original is to analyze and see what possibilities there are for improvements. The purpose of the improved layout is to show what has been accomplished.

First, consider the present or original sketch. On the layout sketch we

will follow the steps taken by the worker.

The first step is to bring the gloves to the sink where they are rinsed and washed (1).

The second step involves taking the washed gloves into an adjacent room for drying. We go to the maintenance room for the autoclaves, where the heat from the autoclaves enhances the drying process. The gloves are left on the drying rack approximately two hours, during which time the worker is free for other duties. This step is (2) and (3) on the sketch.

When the gloves are dry on one side, the operator returns to the drying rack, turns and rehangs them to dry on the other side (4) and (5).

After another one and one-half hours, the worker returns again to remove the gloves from the drying rack (6), and to move them to the testing area in the work room (7).

When all the gloves are tested for holes, they are taken to the powdering area (8). They are then returned to the testing area for packaging (9), and put in the autoclave for sterilization (10). This ends the scope of the "layout" study.

Now look at the flow process chart (Chart II), left-hand side, marked "present method," and see how these things are expressed using the symbols. As we see on the top center of the chart, we are now following the gloves to see what happens to them during the processing.

As one can further see from the identification part of the chart, the study begins when approximately 100 used gloves have accumulated. The accumulation is actually a temporary storage. It is not economical to start the processing of gloves until a large enough number have been accumulated.

Therefore, the study power starts with the transportation of used gloves to the washing sink. This transportation is shown on the chart by putting the number 1 (first transportation in process) inside the arrow symbol opposite the description of the event. Distance will vary widely from one hospital to another—in our particular case we found it to be 200 feet taking approximately one minute to cover. Time is entered in the proper column at the right. In these columns both time (minutes) and distance (feet) are entered for all operations, transportations, inspections, delays, and storages.

In the column to the extreme left the quantity unit is entered. In this example, when each glove is handled separately, the unit is 100. When transferred in a container the unit is one container.

Once the gloves are at the wash sink there will be a delay, as rinsing and washing cannot start until the sinks have been filled. This delay (no. 1) consumes approximately one minute. (A delay occurs when something remains in one place awaiting action.)

The gloves are rinsed with cold water to remove blood, tissue, or other material which might adhere to a used glove. This is the first operation—hence the number 1 is placed in the circle opposite the description of the action. (An operation occurs when an object is intentionally changed in any of its physical or chemical characteristics.) Rinsing gloves with cold water takes three minutes. After the gloves have been rinsed, the water must be drained off. The sink is then filled with warm water to which a soap or detergent is added, and another minute is consumed. This process in itself does nothing to the gloves. Therefore, we again have a delay (2) lasting two minutes.

Now the gloves are washed on one side — operation no. 2, requiring 20 minutes. This is followed by operation no. 3, which involves turning the gloves and washing the other side, then putting them in the opposite side of the sink which contains the warm rinse water. This involves 25 minutes time. The gloves are then rinsed—operation no. 4, requiring two minutes time. (If you test your gloves with water it would probably be during this step; this procedure shows dry testing. This is purely optional.)

Delay no. 3 occurs as the rinse water is drained and the sink refilled with fresh rinse water. Two minutes of time are consumed. The second rinse is an operation, no. 5, involving two minutes. As the second rinse is draining, gloves are transferred to a container and transported to the drying rack—transportation no. 2. The distance: approximately 40 feet; the time 2 minutes. Hanging the gloves on the drying rack is operation no. 6. The time is 10 minutes.

Nothing further can be done to the gloves until they are dried on one side. This takes one to two hours; in this instance, one and one-half hours or 90 minutes. This part of the process is classified as an operation as far as gloves are concerned—operation no. 7. Remember that this is a material chart and there is a physical change in the gloves. The worker is free for other duties during the drying time.

After the gloves are dry on one side, they are turned and replaced on the rack to complete the drying. This is operation no. 8, requiring 20 minutes. Another drying period usually takes less time — approximately an hour or 60 minutes. This drying process is operation no. 9. When the gloves are completely dry, the worker returns, removes the gloves from the rack and puts them in a container. This is operation no. 10, taking two minutes time. The gloves are then transferred to the testing area (transportation no. 3 — distance 40 feet, time .2 minute).

Here the gloves are tested for holes and sorted for size. This involves both an operation and an inspection, which we call a combined activity. (An inspection occurs when an object is examined for identification, for quality, or for quantity.) A square designates an inspection and since it occurs along with an operation we show it as a circle within a square. This is operation no. 11, but inspection no. 1. The time involved is 30 minutes.

When the testing and sorting is completed, the gloves are transferred to the powder box, transportation no. 4, distance 20 feet, time .1 minute. Powdering gloves on one side is operation no. 12, which consumes five minutes. Turning and powdering the gloves on the opposite side is operation no. 13 and takes 25 minutes.

Here the study proper ends. For the sake of completion, however, we also show transfer to the packaging area, transfer to the autoclave, sterilization, and transfer to sterile storage. (A storage occurs when an object is kept in one place or a storage area until used or issued.) These are indicated in the description of events column only; no time or distance has been included.

The summary of the original or present method shows:

Distance moved: 300 feet
Operation time: 294 minutes (150 minutes is drying time, in which the worker is free for other duties)
Transportation time: 1.5 minutes
Inspection time: 0 (was combined with an operation and is shown there)
Delay time: 5 minutes
Total time: 300.5 minutes

Of these 300 minutes, actual man time is only 150 minutes, since 150 are consumed in drying time, during which the operator is free to do other things. Using a pay rate of $1 an hour, which is about average, the cost to a hospital in wages would be $2.55 for 100 gloves.

It has been estimated that a hospital uses approximately 30 gloves per

FLOW PROCESS CHART

IDENTIFICATION

SUBJECT CHARTED: Processing of Used Gloves
DRAWING NO.: _____ PART NO.: _____
POINT AT WHICH CHART BEGINS: After accumulation of used gloves from all departments — LOCATION: All departments
POINT AT WHICH CHART ENDS: When gloves are ready for packaging and sterilization — LOCATION: Central Supply

QUANTITY INFORMATION

Approximately 360 gloves are used per bed and per year in the average hospital.

CHART NO. 1001
TYPE OF CHART: Material
SHEET NO. 1 OF 1 SHEETS
CHARTED BY: Edna Prickett
DATE: May 5, 1953
APPROVED BY: K. G. L.
DATE: May 5, 1953
YEARLY PRODUCTION: 360 gloves/bed/year; 300-bed hospital; 100,000 gloves
COST UNIT: 100 gloves

SUMMARY

TOTAL YEARLY SAVING—DIRECT LABOR: $1,890.00 { Old $2,754.00 / New 864.00 } Saving $1,890.00

INSTALLATION COST OF PROPOSED METHOD

Washer	$ 75.00
Conditioner	650.00
Installation	200.00
Total	$925.00

ESTIMATED NET SAVING—FIRST YEAR: $965.00

	PRESENT METHOD		PROPOSED METHOD		DIFFERENCE	
UNIT COST DIRECT LABOR & INSP	$2.55		$ .80		$1.75	
DISTANCE TRAVELED IN FEET	300		200		100	
	NO.	TIME IN Min.	NO.	TIME IN Min.	NO.	TIME IN Min.
OPERATIONS	13	294	11	82	2	212
TRANSPORTATIONS	4	1.5	1	1	3	.5
INSPECTIONS	1	--	1	--	--	--
DELAYS	3	5	4	11	-1	-6
STORAGES	1	--	1	--	--	--

PRESENT METHOD

QUANTITY UNIT CHARTED	SYMBOLS	DESCRIPTION OF EVENT	DIST. MOVED IN FEET	UNIT OPER. TIME IN Min.	UNIT TRANSP. TIME IN Min.	UNIT INSPECT TIME IN Min.	DELAY TIME IN Min.	STORAGE TIME IN Min.
	O 1 □ D ▽	Accumulation of 100 used gloves						--
1 container	O 1 □ D ▽	Transferred to washing sinks in work room	200		1			
	O □ 1 ▽	Fill wash and rinse sinks with water					1	
100 gloves	1 □ □ D ▽	Rinsed in cold water		3				
	O □ 2 ▽	Water is drained off and sink refilled with warm water and detergent					2	
100 gloves	2 □ □ D ▽	Washed on one side		20				
100 gloves	3 □ □ D ▽	Turned, washed on other side, put in rinse		25				
100 gloves	4 □ □ D ▽	Rinsed		2				
	O □ 3 ▽	Drain water and refill with new rinse water					2	
100 gloves	5 □ □ D ▽	Rinsed		2				
	O 2 □ D ▽	Put in container, transferred to drying rack	40		.2			
100 gloves	6 □ □ D ▽	Hung on drying rack		10				
100 gloves	7 □ □ D ▽	Drying period (approximately 1 1/2 hours)		90				
100 gloves	8 □ □ D ▽	Turned to be dried on other side		20				
100 gloves	9 □ □ D ▽	Drying period (approximately 1 hour)		60				
100 gloves	10 □ □ D ▽	Removed from rack, put in container		2				
1 container	O 3 □ D ▽	Transferred to testing area	40		.2			
100 gloves	insp. 4 □ □ D ▽	Tested for holes and sorted to size		30				
1 container	O 4 □ D ▽	Transferred to powder box	20		.1			
100 gloves	12 □ □ D ▽	Powdered on one side		5				
100 gloves	13 □ □ D ▽	Turned and powdered on other side		25				
Study proper ends	5 X □ D ▽	Transferred to work table for packaging						
	X □ □ D ▽	Packaged for sterilization						
	O X □ D ▽	Transferred to and put in autoclave						
	X □ □ D ▽	Sterilized						
	O X □ D ▽	Transferred to sterile storage						
	O □ □ D 4	In storage until used						

PROPOSED METHOD

QUANTITY UNIT CHARTED	SYMBOLS	DESCRIPTION OF EVENT	DIST. MOVED IN FEET	UNIT OPER. TIME IN Min.	UNIT TRANSP. TIME IN Min.	UNIT INSPECT TIME IN Min.	DELAY TIME IN Min.	STORAGE TIME IN Min.
	O □ □ D 1	Accumulation of 100 used gloves						--
	O 1 □ D ▽	Transferred to washing machine	200		1			
	O □ □ 1 ▽	Fill washer with water (9 gallons)					2	
	1 □ □ D ▽	Machine started, gloves rinsed		3				
	O □ □ 2 ▽	Drain and refill with warm water and detergent					3	
	2 □ □ D ▽	Washed		3				
	O □ □ 3 ▽	Drain and refill with warm water					3	
	3 □ □ D ▽	Rinsed		3				
	O □ □ 4 ▽	Drain and refill with warm water					3	
	4 □ □ D ▽	Rinsed		3				
	5 □ □ D ▽	Turn off machine, drain off water while gloves are removed and excess water squeezed out		3				
	6 □ □ D ▽	Transferred to and placed in dryer, start dryer		.5				
	7 □ □ D ▽	Drying time		30				
	8 □ □ D ▽	Removed from machine, transferred to testing area		1				
	insp. 9 □ □ D ▽	Tested for holes and sorted to size		30				
	10 □ □ D ▽	Placed in powder machine		5				
	11 □ □ D ▽	Powdering time		5				
	O X □ D ▽	Transferred to work table for packaging						
	X □ □ D ▽	Packaged for sterilization						
	O X □ D ▽	Transferred to and put in autoclave						
	X □ □ D ▽	Sterilized						
	O X □ D ▽	In storage till used						

bed per month.* This means 360 gloves used per bed per year, which in wages paid would amount to $9.18 for each hospital bed. A hospital of 300 beds will spend $2,754 yearly in wages.

Now consider the second part of the chart which shows the proposed method. Here mechanical devices are used instead of manual labor in parts of the processing cycle.

The first symbol is a temporary storage — accumulation used gloves. The first transportation, a transfer of the gloves to the washing machine over a distance of 200 feet, requires one minute. The washer is filled with nine gallons of cold water. This delay consumes two minutes of time. (During the filling process the dryer is turned on for preheating.) The machine is then started and the gloves rinsed; operation no. 1, taking three minutes. The second delay (three minutes), occurs when the machine is drained and refilled with warm water and the detergent is added.

Operation no. 2 occurs as the machine washes the gloves in three minutes' time. The machine is drained and refilled with warm water, again taking three minutes — delay no. 3. Operation no. 3 occurs when the machine rinses the gloves for three minutes. Again we have a drain and refill, delay no. 4, taking three minutes. Operation number 4, the second rinse, consumes three minutes. When that is completed, the machine is turned off. As the water drains, the gloves are removed and put in a container. This is operation no. 5 and consumes three minutes.

The gloves are then transferred to and placed into the dryer, operation no. 6, using .5 minute. The drying process (30 minutes) is started. This is called an operation (no. 7) because gloves are undergoing a physical change. (During all the machine time the worker is free for other duties.)

Gloves are removed from the dryer, put in a container, and transferred to the testing area (operation no. 8, taking one minute). We elected to hand and dry-test the gloves, even though machines are available for this purpose. Testing before powdering insures well powdered gloves, as the handling after powdering is kept at a minimum. This is a combined activity —inspection no. 1 and operation no. 9 —as the gloves are tested for holes and sorted for size. It takes 30 minutes—the same as the present method.

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The gloves are then placed in the powdering unit—operation no. 10, time .5 minute. The powdering (five minutes) is operation no. 11.

The study really ends here. Again, for the sake of completion, we show the transportation, to packaging area, the packaging, the transfer to the autoclave, the sterilization, and the transportation to sterile storage in the description of events column. As before, we do not include time and distance, for these events are not part of the study.

SUMMARY

The summary of the proposed method shows:

Distance moved: 200 feet—a reduction of 100 ft.

Operation time: 82 minutes — 47 minutes of which the worker is free for other duties. A total reduction of 292 minutes

Transportation time: one minute

Inspection time: 0—(was combined with an operation time and shown there)

Delay time: 11 minutes (an increase of 6 minutes due to the nature of mechanized equipment used)

Total time: 94 minutes

Of these 94 minutes, actual man time is only 47 minutes, since the machines are working 47 minutes. With the same pay rate ($1 an hour) the cost to the hospital in wages for processing for 100 gloves is now 80 cents, compared to $2.55 by the original method.

For 30 gloves per month per bed (360 gloves per bed per year), the wages spent will be $2.88, compared to $9.18 by the old method. In a 300-bed hospital, the annual labor cost with the old method was $2,754. The new method costs $864 in direct labor, and thus saves $1,890. Of course, one must take into consideration the cost and installation of equipment. The washing machine of the type used in this study costs approximately $75. The glove conditioner, which includes the dryer and powderer, costs $650. If we allow $200 for all eventualities as an installation cost, the total equipment and installation cost is $925. Deduct this cost from the direct labor savings which can be realized, and there is still a net saving of $965, a handsome return for an investment of $925. This is savings for the first year. In subsequent years, in which there is no cost for equipment and installation, the savings will approximate $2,000.

In addition to these direct dollar-an hour savings the proposed method will:

1. Eliminate the disagreeable and monotonous job of handling used rubber gloves.
2. Provide protection against contamination of personnel.
3. Achieve the ultimate objective of preventing the spread of post-operative infections.
4. Raise morale within the department. More things will be done in less time with less effort.
5. Centralize glove processing so that one set of machinery will serve the entire hospital.
6. Necessitate training of fewer people and personnel from only one department.
7. Restrict the dust of powder to one area and thus solve a housekeeping problem.
8. Insure that the best gloves go to the operating room and maternity departments.

SAVINGS

This illustrates one of the tools in the methods engineer's kit applied to one job in central supply service work. To analyze this problem took but a few hours time, yet it shows a saving of some $2,000 in labor cost a year besides the many intangible improvements which cannot be measured in dollars and cents. That seems to be a few hours well spent.

Our problems are many. Methods improvement can help us solve some of them. It can help us to extend the service of the professional nurse, which is our primary objective. All we need is someone to pull us back from our work where we can see clearly and then apply logical thinking.

It is surprising that hospitals, the fourth largest industry in the country, have not taken advantage of the progress made in the field of methods engineering. We are not in a competitive industry, but we do compete in the labor market for good labor.

Industry offers promotions, wage incentives, and fringe benefits which have no equal in hospital work. Therefore, we are at a disadvantage at the very outset. We feel that the only way to overcome this is by improving working conditions and working methods and thereby increasing job satisfaction.

It is time that hospitals woke up to the fact that when it comes to work simplification, we are still living in the horse and buggy days, while the rest of the industrial world is in the jet plane era.

Pre-Packaging

By E. Wayne Comer

● Problems of packaging, sterilizing, and dispensing surgical dressings are continuous. For the past year and one-half I have been doing special studies in nursing education, nursing service, and central supply, and most recently have been directing some nursing studies in postoperative wound care. In all these areas, aseptic technic and asepsis always go back to packaging.

The apparent reluctance of dressing manufacturers to supply dressings in packages suitable for sterilization and dispensing would perhaps be more understandable to hospital personnel if they, like the manufacturers, had reviewed the practices of many hospitals in an attempt to develop some pattern. Confusion and contradiction are present.

Pre-packaging is a top administrative problem, and if any standardization is to be achieved, it must be preceded by an attitude of compromise flavored with give and take to overcome individual preferences. Industry can do almost anything if only there is standardization.

Why is industry interested in the pre-packaging of surgical dressings? It would have an opportunity to give extra service, and it could certainly do packaging at less cost than the hospital can with hand labor.

From the hospital point of view, the questions are many:

1. Is it for convenience?
2. Is it for economy?
3. Is it for legal protection?
4. Is it for patient comfort?
5. Is it for patient safety?
6. Is it for assurance of asepsis?

If the hospital is interested only in convenience and economy, then the grocery or drug store contains hundreds of packaging examples that could fill its requirements. If the interest is in asepsis, then there must be quite a different approach to packaging. Recent studies on postoperative wound care indicate the following areas in which dressings are widely employed:

1. Operating room — about 30 percent of the value of all dressings.
2. Maternity service—about 12 percent.
3. Postoperative wound care
4. Burn cases
5. Trauma wounds

(3, 4, 5) about 58 percent.

OPERATING ROOM

Several months ago a survey was made among hospitals on a sample national basis to determine certain practices of wrapping or not wrapping. At that time the number of sponges put into an O.R. packet varied from two to 50. The most popular unit was 10 sponges per packet, used in approximately 30 percent of the hospitals surveyed.

Some hospitals wrap bundles and include in packet; some put bulk sponges in packet. Others have dispensed with the sponge count, and the surgeon, not the ORS, is now responsible for lost sponges. Usually hospital personnel exhibit considerable feeling that their way is best or the only safe way. Operating room personnel usually count and put up their own bundles for sterilization.

This may, in part, reflect the wide variation of procedures of the individual supervisor or chief of staff. Since those hospitals which have dispensed with the terrific labor problem of "sponge count" are institutions with considerable prestige and acceptance in professional circles, who can say that this may not be a trend and that in five years it will be the generally accepted custom?

No one can question that many customs, precedents, and practices continue in the hospital situation because of individual preference. I have no quarrel with individuality, but if an accurate cost analysis could be made in many hospitals, it would provide an opportunity to determine whether some practices should continue in preference to others which would effect more standardization and economy.

MATERNITY

O.B. dressings make up the second category in which dressings are widely expended. The industry supplies about 14 different sizes and capacities of pads, and hospitals use from one to four pads per dressing change. How do hospitals sterilize and dispense?

Cotton Balls—Postpartum Care (in 48 hospitals):

23—in metal can bulk
2—in glass jars
10—with O.B. pad
4—paper bag bulk
4—wash cloth (non-sterile)
2—tissue (non-sterile)
3—individual packet

Sanitary Napkins (in 51 hospitals):

16—cans
7—bags
25—individual wraps
3—bulk 12's muslin wraps

One large medical school-affiliated hospital wrote asking for one O.B. pad per package or 12 pads per package. If 12 in a package is safe, then one per package may be unnecessary. If one per package is necessary, then is the package with 12 unsafe?

POSTOPERATIVE WOUND CARE

Postoperative wounds usually fall into two general categories. The first includes clean dry incisions. Initial postoperative dressing is put on in surgery following closure and usually is not changed until the sutures or

clips are removed. This obviously is no problem insofar as the packaging of dressings is concerned. The second category includes draining postoperative wounds, which are approximately 85 percent contaminated or are regarded as potentially so. Drainage is sometimes profuse, and large quantities of dressings are expended. It is in this area that hospitals vary in the way in which they dispense dressings.

Postoperative Sponges
(in 69 hospitals):

35—bulk pack cannisters
34—individual put-up (2-4, etc.)

BURN CASES

Burn cases present difficult areas, and care varies from extensive pressure dressings to the open technic. Whenever adequate dressings are procurable that give uniform pressure to all portions of the burn area, best results are generally obtained. The dispensing of small dressings is usually no problem in burn cases.

TRAUMA WOUNDS

Trauma wounds include all types of injuries from accidents or other violence. Dressing use depends upon the character and condition of the wound, which may be contaminated. The dispensing and the application of dressings are usually the same as in postoperative wound care.

The wide variations practiced by hospitals in the wrapping and the dispensing of dressings are only part of the contradiction and confusion. There are recognized professional authorities that question whether sterile dressings actually reach the patient because of breaks in technic of sterilization, dispensing, and application. What does it matter how you wrap dressings if a doctor or nurse removes a soiled dressing by hand and applies a supposedly sterile dressing with the same hand?

Some professional authorities question whether some concepts of postoperative wound care may not be "ancient" today. They question whether or not nurses may be more conscious and insistent upon certain principles of asepsis or aseptic technics in postoperative wound care than the surgeon. It is common practice in some hospitals to make no attempt to sterilize certain dressings for contaminated cases, and in many hospitals even O.B. pads and materials used in perineal care are not sterilized.

Some of the questions that professional authorities have posed are dynamite insofar as industry and public relations are concerned. It would appear that the real problems should be defined by a research board representing all interested parties in the "patient care" situation — the AHA, the ACS, the AMA, and the ANA. After adequate study in micro-biology and extensive cultures in representative hospitals, perhaps the board could set up minimum standards for packaging, wrapping materials, sterilization, and dispensing. Then, a sound foundation would be established from which industry could better serve the hospitals by pre-packaging.

People in industry resist change just as people in hospitals do. To help overcome this resistance to change, industry has made wide use of the "suggestion box," and awards employees cash prizes for ideas on how to do a job better or more economically. The amount of the cash prize for an idea is a percentage of the estimated saving for the first year.

Some nurse administrators and supervisors feel that there is little incentive in many hospitals for changes that could result in savings. They usually are not charged with a budget for expendable supplies, and they feel that they have too little voice in what is supplied their departments. They lack a sense of participating; so they go on improvising regardless of cost. The show must go on — so does the care of the patient.

Industry can do almost anything if hospitals and the professions can define the problem. However, accurate hospital cost accounting and a philosophy that menial labor in a hospital is not cheap must precede any real success in standardization and prepackaging of dressings.

Severe Dermatitis Is Eliminated by Complete Removal of Residual Drugs from Syringes

● The increasing use of syringes for antibiotic therapy, blood chemistry determinations, and hematologic studies have made syringe supply a major problem for hospitals. The evidence that one of the etiologic factors in the transmission of homologous serum jaundice is the residual contamination in syringes and needles[1,2,3] makes heat sterilization imperative. The necessity of heat sterilization for syringes and needles used in immunization procedures has also been documented.[4]

Those who work with syringes and needles are prone to develop severe dermatitis from contact with residual drugs left in their syringes. This hazard is substantially averted by the use of a washing machine. Such machines remove many injectable substances which are compounded in oil or stearate bases and are difficult to remove with manual washing; hence, mechanical cleaners must be relied upon.

WASHING TIME CUT

At the Peter Bent Brigham Hospital, Boston, a technic has been developed which makes the processing of 41,000 syringes a year feasible in approximately one-quarter the time heretofore required. Cumbersome, time-consuming, expensive wrappings are eliminated, and patients are furnished a sterile syringe for every medication or treatment. Breakage is less because syringes are no longer lost in the maze of wrappers, dropped to the floor, or sent to the laundry.

The soiled syringes are returned to the Central Supply Room with other used equipment. The plunger and barrel are banded together with a rubber band and placed in wash baskets with the barrel opening dependent. Syringes are packed with no discrimination as to size (Figure 1). The wash baskets are locked in the washer. Detergent is added and the wash cycle started. The washer* is a mechanical one in which a horizontal revolving wash wheel is arranged to support adjustable trays and baskets which carry the glassware into the washing solution and out again to drain. After the glassware is washed (20 min.) the detergent is drained and a hot or cold water rinse is turned in (10 min.). The syringes are left impeccably clean. There is no breakage if care is taken to pack the baskets firmly and lock them securely in the washer. The washer cleans approximately 200 syringes of assorted sizes in approximately 30 minutes.

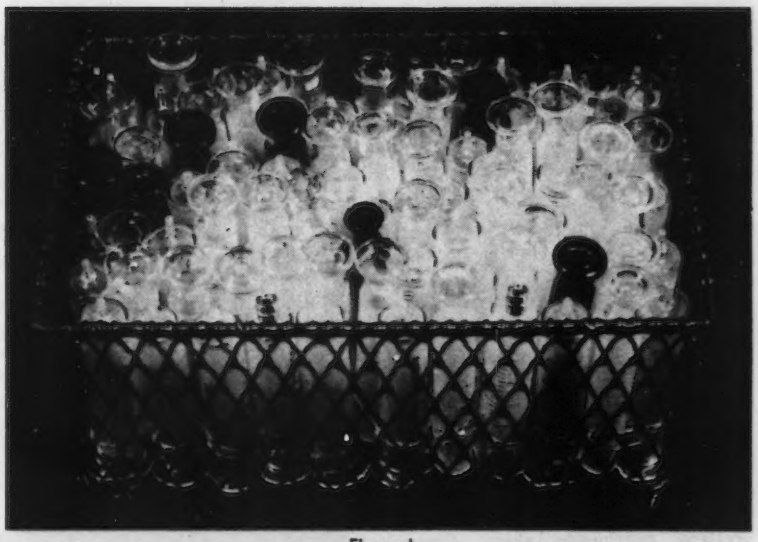

Figure I

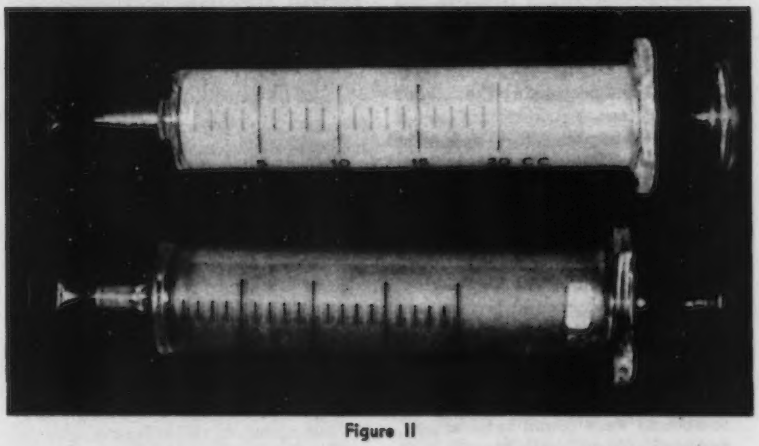

Figure II

Char-Lab Junior, Eimer and Amend, New York City

After removal from the washer, the syringes are placed in a suitable place (radiator, sterilizer, etc.) for thorough drying. They are then assembled and a plastic shield placed over the syringe tip (Figure 2). The syringes are sorted into baskets by size, and the baskets are loaded on the sterilizer carriage of an ordinary dressing sterilizer.

Because the virus of serum hepatitis cannot be reliably destroyed by any other means, heat must be relied upon for sterilization. The virus has been shown to retain its ability to produce jaundice after exposure to 60°C. (140°F.) for four hours.[5] Other studies[6] have established the requirement of exposure to saturated steam for 30 minutes at 250°F. (121°C.) or dry heat at 170°C. (338°F.) for two hours as minimum standards for destroying the virus. When syringes are sterilized in steam, the parts must be separated so that moist heat reaches the inside of the syringe; otherwise destruction of bacteria will not occur. If the barrel and plunger are assembled with the necessary film of moisture, the ground glass is attacked by the water and the alkali leached out will subsequently destroy certain drugs. Hence, to sterilize syringes assembled, dry heat must be used. A practical technic is to load the autoclave at the end of the day's schedule, lock the door, turn steam into the jacket ONLY, not into the chamber. The contents of the chamber are heated by radiation and convection to 250°F. (121°C.), and the syringes are exposed to dry heat at this temperature for the four hours required to destroy the most resistant bacteria. A convenient technic is to load the autoclave as described, turn the steam into the jacket and leave the syringes in the sterilizer overnight. The additional exposure has no deleterious effect on either the glass syringe or plastic shield.

The syringes are removed and are available for immediate use. The plastic shield seals off the tip of the syringe so that the plunger cannot be removed until the seal is broken between the shield and syringe. This is accomplished by gently twisting the shield and pushing it against the tip. Added advantages of this technic are quick identification of syringe size and storage requiring less space.

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A Durable Thermometer Pigment

Several members of the Research Committee of the Hospital Bureau have reported satisfactory results with the new silicone thermometer pigment supplied by the National Bureau of Standards for experimental purposes. One member of the Committee, J. H. Wallace, purchasing agent, Grace-New Haven Community Hospital, has sent us the following report on the use of this pigment in his institution:

> "Grace-New Haven Community Hospital has been using the sample NBS silicone marking material which was supplied to members of the Research Committee of the Hospital Bureau with good results. The method of applying the material is as follows: The thermometers are first cleansed with soap and water and dried thoroughly. The silicone compound is then applied with a cotton applicator with strokes in the same direction as the marking on the thermometer. Two solvents for removing excess compound were found satisfactory, namely, carbon tetrachloride and acetone. Excess compound is removed by light strokes over the surface with a single sheet of tissue of low absorbency. The thermometers are then dried in air at room temperature for ten days.
>
> Thermometers prepared in this manner showed good pigment durability for better than six months of daily use."

The silicone compound referred to above can be made in accordance with instructions supplied by the National Bureau of Standards. However, the method is not simple and some of the ingredients may be difficult to obtain. Most hospitals will prefer to buy their thermometers with the new pigment already applied. The graduations on all Eisele thermometers handled by the Hospital Bureau under our Agreement T-3 are now made of this new pigment. A few other manufacturers are applying this pigment and information about these sources will be issued at a later date.

Reprinted from the Bulletin of the Hospital Bureau of Standards, 270 Park Ave., New York City

Use Smaller Sponges

It frequently happens that an institution can make very large savings by changing to a different size or style of a particular item. Two hospitals have recently made studies of their use of gauze sponges to determine if any savings could be made by adopting smaller sizes. They found that they could change to a smaller size, namely from a 4" x 4" to a 3" x 3" sponge without loss of effectiveness. The saving for the all-gauze type sponge is about 16 percent; for the cotton-filled sponge it is much greater — about 45 percent.

Allen Mathewson reported that when the Massachusetts General Hospital made a change from the 4" x 4" to the 3" x 3" sponges its cost for surgical dressings was reduced markedly thereby resulting in a saving of several thousand dollars a year. Warren Irwin, Strong Memorial Hospital, reported a saving of more than a thousand dollars in an eight-month period when 3" x 3" sponges were substituted for the 4" x 4".

A comparison of the prices for the two sizes of sponges will enable any institution to determine the total savings for a six-month or a year period. The following are the Bureau's prices on Marsales sponges:

All-Gauze Sponges

3" x 3"	12 Ply 4M/Carton	$25.40/ctn.
4" x 4"	8 Ply 4M/Carton	30.35/ctn.
4" x 4"	16 Ply 2M/Carton	27.06/ctn.

Cotton Filled Sponges

3" x 3"	..... 4M/Carton	$23.82/ctn.
4" x 4"	..... 2M/Carton	21.82/ctn.

Terms: 2% — 10 days: delivered

Reprinted from the Bulletin of the Hospital Bureau of Standards, 270 Park Ave., New York City

CENTRAL SUPPLY ROOM

Alert Supervisor Improves Her Department

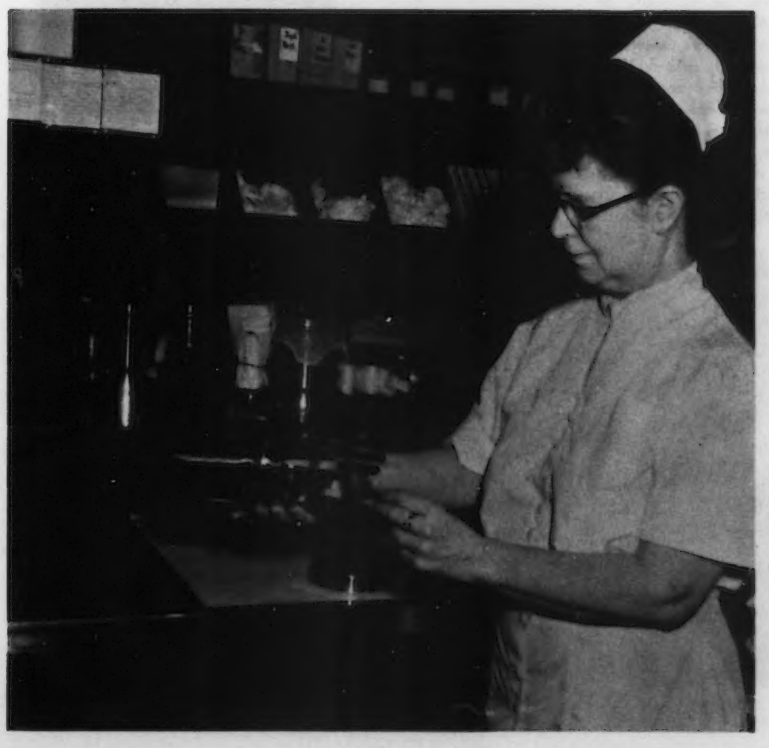
• An alert supervisor who is always looking for new ideas to improve her department is Mrs. Gertrude Beaver, R.N., who heads the central supply department at Bishop Clarkson Memorial Hospital, Omaha, Neb.

Some time-saving and efficiency-promoting measures used at the Clarkson Hospital are Mrs. Beaver's own ideas. Others she has picked up from central supply departments in other hospitals, and has adapted to her needs. Whenever she hears of a department in the area from which she might to able to learn something, she tries to arrange a visit to that hospital.

The result of her efforts is a smooth-running department which, although confined to a relatively small space, takes care of a large volume business in an efficient manner.

Not all ideas originate with her or with other hospital personnel. The large mirror placed strategically to "show off" Clarkson's autoclaves, which otherwise would remain out of sight in the corner, was put up at the suggestion of Mrs. Hal G. Perrin, wife of the hospital's administrator.

HOSPITAL TOPICS here shows in pictures some of the procedures which make work easier in Clarkson's central supply.

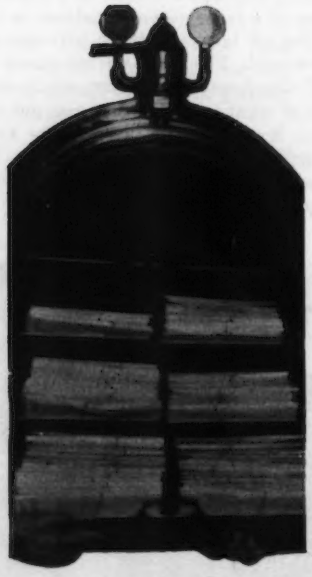


Above: With this set-up for filling distilled water jugs, there is no danger of water running all over the floor if no one is nearby to shut it off when jugs are filled, and a person who might have to stand by and watch during the filling process is freed for other duties. Water drains into bottles through ordinary rubber tubing, and overflow runs through tubing to waste outlet on floor. Setup shown here is for 12 five-gallon jugs, but as many as wanted could be filled by adding extra tubing.

Left: Mrs. Beaver devised this nail file holder, used in surgery and O.B. by doctors and nurses when they scrub up. Doctors liked the idea so well they copied it and took it to other hospitals.

Ann Cossairt works at specially constructed desk which holds needles and constriction tubes. Needles are sorted and filed in drawers according to sizes. Different colors are used to distinguish sterile from non-sterile needles—red for sterile, blue for non-sterile. Needles are considered sterile for two weeks. Needle cleaner is on desk, in front of Mrs. Cossairt. This color system is a dating system. Color is changed every two weeks.

Below: Card system speeds up assembly of most frequently used trays and sets. Cards listing contents are posted above assembly counter. Some cards have photographs showing the trays as they should look when completed. Here Mrs. Edith Staats checks card as she assembles bladder irrigation tray. Labels and pins are in bins below the cards. Contents of other trays and sets are listed in notebooks in the room. Cards also are used to list contents of autoclave loads, and are placed in metal holders beside autoclaves.



Specially constructed, double-row basket for autoclaving gloves is put into the autoclave. Basket is full width of autoclave and thus makes use of waste space left by narrower commercial models. Seventy-two gloves can be sterilized.

Issuing Thermometers from Central Supply

By Bob Byrne, Administrator
Providence Memorial Hospital
El Paso, Texas

Thermometers used to be a "disposable" item at Providence Memorial Hospital until it was decided to clean and issue them through our Central Supply Department. When individual thermometer holders and thermometers were kept at each patient's bedside, we issued as many as 100 thermometers per month to the various nursing units. Of this number, about 25 were reported broken each month. "Thermometer and holder were accidentally knocked to the floor," "Wet thermometer slipped through my fingers and fell to the floor when I was shaking it down," were the two main reasons given for the breakage.

But—what was happening to the other 75 thermometers? We did not get this answer until we had one of the nurses check each patient's room to pick up the thermometer immediately after he was discharged, only to find repeatedly that the patient must have packed the thermometer with his belongings. The thermometer was brought in to him when he was admitted, so it was his, must have been the patient's philosopy.

Keeping the thermometer in the patient's room posed another problem. The average patient stay is six days, but were we sure the solution in the thermometer holders was changed regularly? Were we sure the thermometer and holder was cleaned thoroughly and fresh Zepherin added to the holder before the new patient was admitted? What about the patient who stayed in the hospital for a month? Was his thermometer and holder ever cleaned and the solution changed? Another big expense was the thermometer holders, which cost approximately three dollars each. At least ten were broken each month.

Today we are issuing approximately 20 thermometers to Central Supply each month, and have no worry about breaking thermometer holders as we no longer use them, except for patients in isolation.

Central Supply now issues thermometers on an exchange basis, in four ounce, clear plastic glasses containing 24 oral thermometers, and in plastic glasses with three rectal thermometers.

Following is the procedure used by personnel in Central Supply in cleaning and readying the thermometers for issuance to the nursing units:

1. Dirty thermometers are placed in a wire frame after checking each one to make sure there is no mucus on it.
2. The wire frame with thermometers is then placed in a pan containing a four percent solution of pyroneg, for a minimum of 20 minutes..
3. The thermometers are then rinsed in clear water.
4. The wire frame with the thermometers is then transferred to another pan containing Zephiran (1:1000) for a minimum of 20 minutes.
5. The thermometers are then removed from the basket and placed in the Clay-Adams thermometer shaker and shaken down by centrifugal force within a few seconds.
6. The thermometers are then placed in the clear plastic glasses and are ready to be issued to the floors.

Each unit has two wire bottle-holders, the eight-nursing-bottle size, which we use as thermometer holders. The eight compartments of the holders are filled as follows:

1. A four-ounce plastic glass holding 24 clean, dry oral thermometers.
2. Plastic glass containing cotton balls saturated with green soap.
3. Jar of lubricant.
4. Plastic glass holding three clean dry, rectal thermometers. The glasses with the rectal thermometers are plainly marked, having a red border painted around them; the tip of each rectal thermometer has been dipped in red paint.
5. Plastic glass for dirty oral thermometers.
6. Plastic glass for used cotton balls.
7. Place for TPR book.
8. Plastic glass for dirty rectal thermometers.

In the classifications listed above, numbers one through four are on one side of the holder and it is labeled "Clean Side." Numbers five through eight are on the dirty side.

Our thermometer replacement expense has dropped from a high of $130 per month to approximately $25 per month. We know that all patients receive a thoroughly cleaned thermometer each time. The nurses are happy, too—no more lost time shaking down thermometers.

Sterilization of Supplies*

Part I-Sterilization by Chemicals

By Velma L. Chandler, Ph.D.**

My first suggestion is that you read the labels when you're considering new chemical sterilizing agents. Don't be misled by what an enthusiastic salesman has to say, or be guided in your purchases by a penny-pinching purchasing agent. Read the labels!

There are federal agencies which control the claims made for all those agents. Read the labels, read the brochures, and then you will know in which situations they can reliably be used.

If you don't understand the bacteriologic data that are presented, go to your bacteriologist. He will be able to help you. Having obtained the information to validate the claims made, you will have a much better basis for a rational use of chemical agents.

Although we have many qualms about chemical sterilizing agents, we do realize there are situations in which they must be used. One must recognize their limitations and use them rationally.

An ideal chemical sterilizing agent provides complete and rapid destruction of all micro-organisms, is non-irritating and noncorrosive, is active in the presence of organic matter, and is economical. (See Figure 1.)

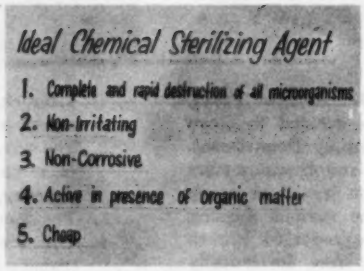

Ideal Chemical Sterilizing Agent
1. Complete and rapid destruction of all microorganisms
2. Non-Irritating
3. Non-Corrosive
4. Active in presence of organic matter
5. Cheap

Figure 1

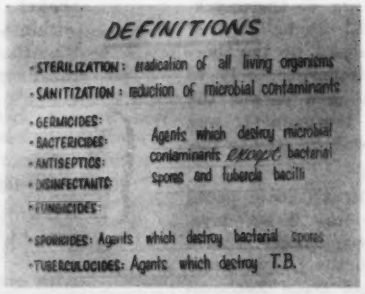

DEFINITIONS
• STERILIZATION: eradication of all living organisms
• SANITIZATION: reduction of microbial contaminants
• GERMICIDES:
• BACTERICIDES:
• ANTISEPTICS:
• DISINFECTANTS:
• FUNGICIDES:
Agents which destroy microbial contaminants except bacterial spores and tubercle bacilli
• SPORICIDES: Agents which destroy bacterial spores
• TUBERCULOCIDES: Agents which destroy T.B.

Figure 2

It is also desirable that the agent be nonstaining and that it have either a pleasant odor or no odor.[1]

For the purposes of discussion, I would like to define sterilization as the complete destruction of all micro-organisms, and sanitization as a reduction in the number of micro-organisms.[2] The terms "germicide," "bactericide," "antiseptic," "disinfectant," and "fungicide" we shall consider as agents which destroy microbial contaminants, *except* bacterial spores and the tubercle bacillus. (See Figure 2.)

Sporicides are agents which destroy bacterial spores, and tuberculocides are those chemical agents which destroy the tubercle bacillus.

I think that Figure 3 gives a little better idea of what we are fighting with all of these chemical sterilizing agents. The artist has depicted the use of a germicide and the effectiveness of it. On the left are the common

*Transcript of discussion presented at Second Annual Conference, A.O.R.N., St. Louis, January 24-27, 1955.

**Dr. Chandler is chief, department of microbiology, Ethicon, Inc., New Brunswick, N. J.

[1]It should also be effective against organisms coated with oil, grease, and fat.—ED.

[2]"Sanitization" more generally implies the destruction of vegetative organisms only.—ED.

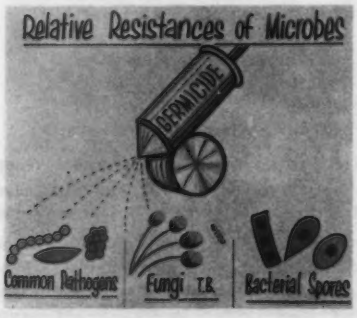


Figure 3

Figure 4

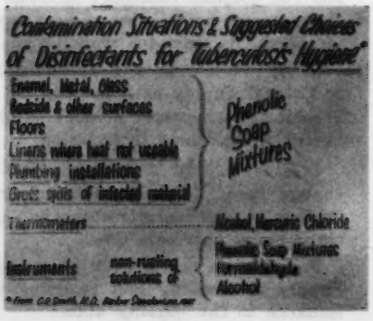


Figure 5

pathogens, the non-spore-forming bacteria. They are readily knocked out with almost any of the hundreds of germicidal agents on the market today. If you're trying to combat that single type of organism, almost any agent is effective.

More resistant to germicides are the fungi and the tubercle bacilli.

The highly resistant forms are the bacterial spores. They are shown in the picture contained within the bacterium itself, but the cytoplasm on the outer portion of the bacterium disappears, and the darker center part remains as the spore. As far as resistance to any destructive agent is concerned, there is nothing that is harder to destroy than bacterial spores. They are the most resistant of living forms.

Figure 4 shows you a cross section of a bacterial spore. Chemists have attempted to analyze these spores and to determine why they are so resistant. The only conclusion is that they contain more calcium than do the vegetative forms of the bacteria, but apparently not enough to explain their resistance to chemical agents and heat.

Many of you are interested in agents for use in decontamination of tubercle bacilli. C. Richard Smith, M.D., of the Barlow Sanitarium, published, in *Soap and Sanitary Chemicals*, September-October, 1951, data recommending phenolic soap mixtures. For thermometers he recommends alcohol and mercuric chloride, and for instruments, nonrusting solutions of the phenolic soap mixtures, formaldehyde, and alcohol. (See Figure 5.)

There are differences in the resistance of sensitive cells, average cells, and tough cells, all of which occur in a given population of bacteria, to chemical agents and to heat. We must combat the tough cells. (See Figure 6.)

There are several factors which affect germicidal efficiency, and there must be an optimum balance to effect killing as shown in Figure 7. The concentration of the agent must be correct; the temperature of the chemical agent must be considered. Most chemical agents are more effective if the temperature is raised. In actual use, it is seldom practical to elevate the temperature, but even a slight temperature rise will result in more efficiency. Another factor is reaction, or pH, the acidity or alkalinity of the mixture.

A very important factor is exposure time. You will find, if you carefully read the brochures and the labels accompanying these agents, that the manufacturer tells you the required exposure time.

Finally, there must be a minimum amount of organic substance present —that is, blood, pus, or tissue, since the protein combines with the chemical agent, neutralizes it, and reduces its efficiency. (See Figure 8.) This points up the fact that one must have thoroughly clean instruments, syringes, etc., for the chemical agent to work upon the organisms.

Another important reason for ridding instruments of the proteinaceous material prior to sterilization, as I have described, is that organisms are protected by the protein within crevices and hinges. No chemical agent can destroy bacteria unless there is direct contact. I would like to emphasize the extreme importance of good, thorough mechanical cleansing of glassware and instruments. (See Figure 9.)

Wherever heat can be used, use heat. It is the best sterilizing agent. Don't try to take short-cuts. It's those bacterial spores we have to fight, and we have to pretend they're always with us.

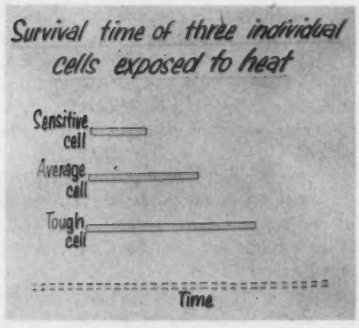


Figure 6

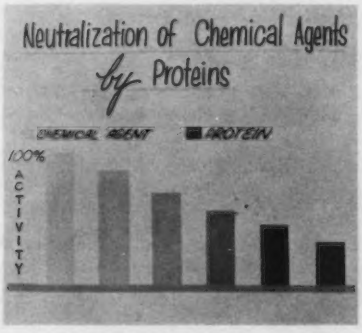


Figure 8

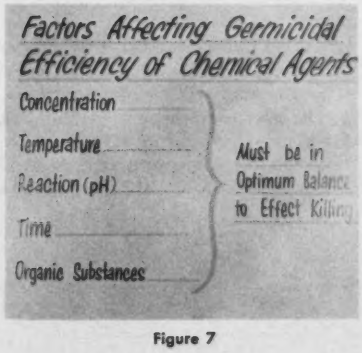


Figure 7

Figure 9

Sterilization of Supplies*

Part II.-Problem-Solving Clinic

MODERATOR: Mrs. Verna Wilson, R.N., Former Operating Room Supervisor, Barnes Hospital, St. Louis

PANEL: Velma L. Chandler, Ph.D., Chief, Department of Microbiology, Ethicon, Inc., New Brunswick, N.J.—"Sterilization by Chemicals"

P. L. Engler, Scanlon-Morris Division, Ohio Chemical and Surgical Equipment Co., Madison, Wis.—"Sterilization by Saturated Steam"

Helen Horvat, R.N., Central Supply Supervisor, John Cochrane VA Hospital, St. Louis—"Sterilization by Dry Heat"

J. N. Masci, Director, Pharmaceutical Research Section, Johnson and Johnson, New Brunswick, N.J.—"Packaging of Supplies"

Q. We have a 60-bed hospital, and the question of sterilization of our packs arises constantly with every new piece of literature published. We include gowns and towels in our major packs, and have been autoclaving them for one hour. Is that too long?

MR. ENGLER: The time of sterilization is going to be governed by the size and arrangement of the pack, because in order to get complete sterilization—and I presume that you're talking about steam sterilization—there must be complete penetration. You must be very careful in packaging and folding gowns and various other materials to allow for penetration by steam. In other words, the pack shouldn't be in excess of 12 x 12 x 20,[1] and should be very carefully made up so that there are not layers of impervious material to restrict the flow of steam through the pack. The steam must get down into the center of the pack.

The other factor to consider is the position of the pack in the sterilizer. The pack should be positioned so that the layers are vertical. In that way steam will penetrate, because the steam comes in at the top as the air goes out at the bottom, and can work its way through this pack.

When loading a sterilizer, I imagine that I am going to sprinkle the load with water and want the water to run down off the pack.

MR. MASCI: The questioner did not mention the temperature of sterilization. It's rather difficult to say whether one hour is too long or not long enough without knowing the temperature used, but I assume that she's talking about the customary technic of sterilizing at approximately 250° F. (121° C.)

What Mr. Engler has said is all very true. The actual time of sterilization can be as short as 20 minutes at 250° F. But this time is counted only from the time that the entire sterilizer reaches that temperature, for if the pack is not properly made up and wrapped it may require at least 20-40 minutes to reach sterilizing temperature. (See Figure I** at right.)

Most of you are familiar with the prescribed rules for making up a surgical pack. However, I'll go over a few of the major points, so that at least we will know that we agree on the basis for packing, particularly packing the larger surgical pack.

It is advisable to place towels and compresses and drapes, folded and one on top of another, so that all the layers are in the same direction. That pack should then be placed in the autoclave so that those layers of fabric are vertical, as Mr. Engler mentioned. The reason for that is that the steam will then displace the air gradually as it moves through the autoclave.

The pack must be loosely packed, and wrapped in such a way that the muslin cover will permit steam penetration but will not permit recontamination later.

Even under the best conditions, it is found that a pack of the prescribed size—no greater than 12 x 12 x 20—will require at least 10 or 15 minutes to reach the proper temperature. If one adds 20 or 30 minutes for the steriliza-

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*Second and concluding part of the transcript of a panel discussion presented at the Second National Conference, Association of Operating Room Nurses, St. Louis, January 24-27, 1955.

**Accompanying illustrations are from *Aseptic Treatment of Wounds*, by Carl W. Walter, M.D. and are reprinted by permission of the Macmillan Co., publishers.

1. This size allows for easy handling and is one on which studies of heating and penetration times have been done on standardized material.—ED.

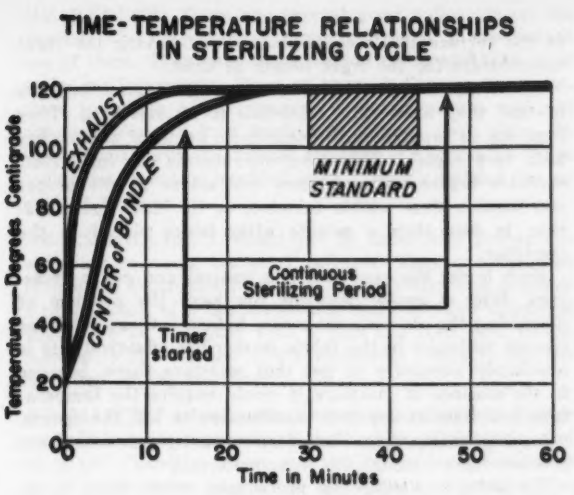

Figure I

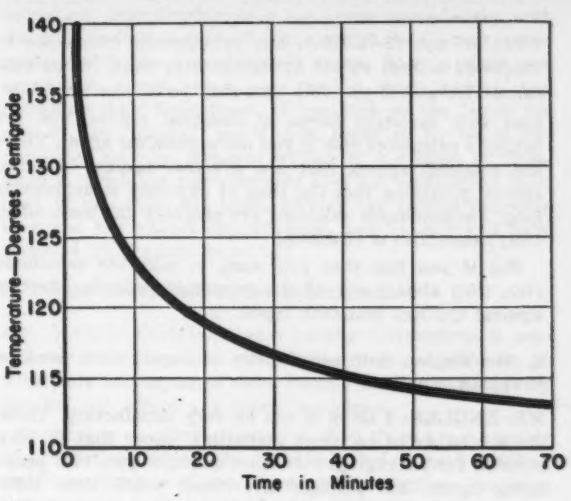

Figure II

tion time, one would conclude that under the best conditions the job could be done in 40-45 minutes.[2] So one hour may be a little too long. (See Fig. II, next page).

Q. Do you sterilize suture needles in dry heat, and how do you wrap them? If Vaseline gauze has been sterilized by a hot-air sterilizer for two hours, how long is it considered safe—that is, when it's stored in a covered dish?

MISS HORVAT: We'll start on the first one. Because of the danger of transmission of homologous serum jaundice, all suture needles are sterilized by heat—one hour dry heat at 160° C. (320° F.); four hours at 121° C. (250° F.), or 30 minutes at 250° F. in saturated steam.

In answer to the question about sterilization of Vaseline gauze, sterilization by dry heat is dependent on many factors: the amount to be sterilized, the container's surface and depth, and the temperature used. It is advisable to sterilize Vaseline gauze and ointments in small quantities —preferably enough for one application only—thereby avoiding the possibility of contamination by dust particles and air-borne bacteria, once a larger container is opened.

An effective way to prepare Vaseline gauze is to place 15-20 strips of 2" roller bandage, 8" long, in a small catheter tray. These, I believe, measure about 2½" wide, 1½" deep, and 8" long. Melt the Vaseline and add approximately three ounces to the gauze strips. I have found this to be most effective. It is my feeling that more than three ounces of Vaseline makes gauze which is too thick for easy handling.

Then sterilize this Vaseline gauze at 150° C. for two and one-half hours, or 170° C. for half that time.[3]

Q. While we're on the subject of Vaseline gauze, here's another question: In the sterilization of Vaseline gauze we are told to moisten the gauze for autoclaving if no hot-air sterilizer is available. What about that?

MISS HORVAT: To moisten the gauze if no hot-air sterilizer is available is good. Dr. Walter recommends the sterilization of Vaseline gauze with the ordinary dressing sterilizer. You get sufficient steam during the melting process of the Vaseline to provide the moisture that would be required to kill the most resistant spores. Moisture is required to kill the resistant spores, and kills them in less time than it would take with dry heat.

Q. Dr. Chandler, what are most hospitals using to sterilize their eye instruments? Sharps, cataract knives, and so forth? How do you sterilize eye instruments, also urology instruments? Do you boil sharps for eye surgery? I think you can also include bronchoscopic and GU instruments, because we have questions about them.

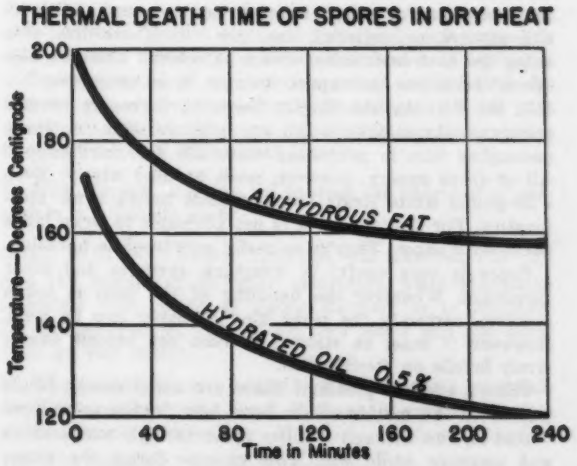

Figure III

DR. CHANDLER: I think it's ridiculous to ask: "What do most hospitals do?" That's not the answer to any problem. What *should* most hospitals do? As I stated be-

2. Studies have shown that a sterilizing period of 30 minutes allows for complete penetration of a load plus 13 minutes for destruction of the least accessible spores in the standard pack.—ED.

3. It has been suggested elsewhere in this magazine that Vaseline gauze be prepared as described, hydrated with 2-3 cc. of water, and sterilized at 160° C. (320° F.) for one hour or 121° C. (250° F.) for four hours. —ED.

fore (see pp. 72-73-ED.), any instruments which can be subjected to heat should be sterilized by heat. When they cannot be, and if you feel that they have been contaminated with resistant forms of bacterial spores, you are taking a calculated risk if you use a chemical agent. There are chemical agents that are effective against bacterial spores, providing that the time of exposure is sufficiently long. Formaldehyde solutions are probably the most effective; iodine also is effective.[4]

But if you feel that you want to take the calculated risk, then almost any of the germicides will be effective against the less resistant types.

Q. Mr. Engler, how satisfactory is paper when used in wrapping supplies?

MR. ENGLER: I think it can be very satisfactory. There are a number of concerns marketing paper that is very suitable for packaging. Now that question gets into packaging again, and perhaps Mr. Masci would have some comment. The only concern that I have about packaging by paper is that when those packs are stored for a period of time the paper will become dried up, and there is a tendency or a possibility of the paper's becoming torn. That is just a personal opinion. I'm still of the old school, accustomed to two thicknesses of muslin—not a canvas, no impervious wrapper such as that. But two layers of muslin is very satisfactory. We do know that there are satisfactory paper wrappers available. I received some nice samples of some unusually tough, porous paper that I'm sure would be very satisfactory. Mr. Masci, do you have anything to add?

Q. As Mr. Masci talks, I think he can give us something on this at the same time: In case the emergencies increase the operations for a day's schedule and you need additional silk sutures or material, can you "flash"-sterilize silk, using the flash instrument steam autoclave? Can you also "flash"-autoclave unwrapped sponges in an emergency?

MR. MASCI: As Mr. Engler has said, there are several papers on the market which are quite suitable for many packaging jobs in preparing materials for sterilization.[5] All of these papers, however, must be used wisely. Even a 35-pound white Kraft becomes quite brittle after sterilization. For that reason it is not advisable to wrap large packs with paper. They're so easily punctured in handling.

Paper is very useful in wrapping syringes and other glassware. Wherever the handling of the item is not a problem, certainly the right kind of paper can be used. However, it must be strong; it must not become excessively brittle on sterilization.

There's another problem. There are many strong Kraft papers on the market which have been highly calendered —that is, run through a roller press at high temperature and pressure while wet. This process forms the paper into a good, tight paper, but unfortunately it's a little too tight. This kind of paper reduces the rate at which steam penetrates quite a bit.

To go into the other question, I think it would be well to consider first just why "flash" sterilization is considered acceptable for metal instruments.

Remember that the prime considerations in killing bacteria by saturated steam are having moisture present at the surface that's contaminated and having the right temperature for the right length of time.

Metal instruments are unique among surgical supplies in that they have only a surface to be sterilized. They need not be penetrated. Furthermore, being of metal, they heat very rapidly. Therefore, instruments can have their surfaces loaded with moisture and arrive at the proper sterilization time within minutes, or in "flash" sterilization, in less than a minute after being placed in the sterilizer.

Such is not the case with silk sutures and gauze dressings. With a gauze dressing you have the problem of displacing the air with the steam before you can condense enough moisture in the fabric to sterilize effectively. It is absolutely necessary to get that moisture there, because in the absence of moisture it would require the temperature and time of dry-heat sterilization to kill the spores. (See Fig. III, p. 72). Therefore normally you would not consider such a technic for these materials.[6]

However, in emergency procedures, when there is no other recourse and a human life hangs in the balance, certainly any step toward minimizing the risk but controlling the emergency may be justified by the surgeon.

Q. Is it necessary to moisten the inside of drains, catheters, tubing, and so forth before autoclaving?

MR. ENGLER: The inner side of the catheters and tubing is always moistened, because the rubber will not allow the steam to penetrate from the outside in, and if the tubing does contain moisture that will be flashed into steam when the temperature is raised in the autoclave, you have the effect of saturated steam to accomplish the sterilization.

Q. Please suggest the proper method of keeping Penrose drains sterile in surgery. Miss Horvat, will you answer that?

MISS HORVAT: I would advocate preparing Penrose drains in single containers. I think the more you can fix your containers for just one usage, the better technic you'll carry on throughout. But I would recommend trying to anticipate your needs for a particular day and preparing accordingly, to avoid carry-overs and use of possibly contaminated items.

Q. Anybody else on the panel have any ideas? Probably we'd better let that ride. I know it's done millions of different ways.[7] Now, what method can be used in checking autoclaves for effectiveness in sterilization, other than doing cultures on sterilized packs and using Diack controls?

MR. ENGLER: I consider the use of a potentiometer a good way of checking sterilizer efficiency. A potentiometer is a device in which a thermocouple, which is just a heat-sensitive junction of two wires, is located in the center of a pack or flask. The wires are brought out the sterilizer door, and the time required for the center of the pack to reach sterilizing temperature is either read on a dial or recorded on a temperature chart.

Another possibility is the use of "telltale" thermometers which are located directly in the pack. The temperature, as with an ordinary fever thermometer, will stay at the maximum point reached until the thermometer is shaken down.

Q. Mr. Engler, what do you think of the chemical indicators on the market today?

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4. Caution must be taken to rinse thoroughly all residual germicide from the instruments before they are used.—ED.

5. Bacteriologic data substantiating the use of these paper wrappers has not been readily available.—ED.

6. Small quantities of silk, unwrapped and hydrated prior to being placed in the sterilizer, can be effectively sterilized in the high-speed sterilizer. —ED.

7. Penrose drains can be prepared as any other surgical supply—packaged in muslin wrappers, sterilized at 250° F. for 30 minutes, and stored in a clean, dry, vermin-free place until used.—ED.

MR. ENGLER: There are several good indicators on the market. The only thing I'm worried about is the proper use of them. They have to be located right, and they have to be read correctly. Some of these indicators have sections in which color changes. A dozen people will get different ideas of how much of a change took place. So you always have the human element in the use of those indicators. I really wouldn't care to say anything for or against them.

DR. CHANDLER: I would like to know why people are objecting to using bacterial cultures. They are the best indicators. Baltimore Biological Laboratories now supplies a preparation of a heat-resistant, spore-forming organism which can be sterilized with a load and then sent to the laboratory for culture.[8] It's a wonderful indicator for the efficiency of the sterilizer.

MR. MASCI: I want to comment first on what Mr. Engler said. He's quite right about the matter of controls, and so is Dr. Chandler. There are two bases for establishing good controls for hospital or any other sterilization. One is that by the use of resistant organisms placed in strategic parts of the load under actual operating conditions, you demonstrate that under a given set of conditions you can kill these bacteria.

The second is that a set of mechanical controls is needed to demonstrate that these conditions are maintained or reached every time the autoclave is run. One without the other is not quite complete. And although it may seem redundant for you to have each hospital check its sterilizers, it is a fact that the actual conditions of making a pack and running a sterilizer vary so that it is indeed worthwhile to check the conditions of sterilization with bacterial cultures. The other controls are mechanical and insure the proper functioning of the sterilizer. By the proper use of bacterial cultures, you can gain assurance of the reliability of the thermometer, the recording thermometers in the exhaust line, and the pressure gauges.

Q. If the most heat-resistant spores are destroyed in 13 minutes' exposure to saturated steam at 250° F., why do you recommend 20-30 minutes after the pack is entirely heated throughout?

MR. MASCI: The only reason is to provide a margin of safety. When I say to start timing after the pack is entirely heated throughout, we must recognize that not all the packs are going to reach temperature at exactly the same time, and some provision must be made for those packs which contain either denser materials or are more densely packed. It is just the margin for error.

Q. Dr. Chandler, where do you obtain the spore indicators?

DR. CHANDLER: Baltimore Biological Laboratories, Baltimore. Md.

Q. Dr. Chandler, is Zephiran solution safe to sterilize sharps, needles, and instruments? How long is the sterilization time?

DR. CHANDLER: Zephiran is one of the quaternary ammonium compounds, of which there are thousands. They are not sporicidal. I have no concrete evidence that they are tuberculocidal either. They do kill off common bacterial pathogens, and they will attack the molds and the fungi.

Knowing those limitations, you have to decide whether you want to take the calculated risk that I mentioned before, and use them in a given situation. One word of warning, however: The time of exposure is extremely important. Sterilization does not occur immediately with the more resistant type of organism; it does occur rather readily with the less resistant types. So you must use sense and reason when you employ these agents, and recognize their limitations. If you look at the labels for any of the "quats," you'll find there is no claim for sporicidal activity. Are you willing to use them in situations in which the manufacturer does not recommend their use? If you must use them, employ the correct exposure time and the correct concentration, and be sure you have removed all organic material.[9]

Q. Please discuss boiling of instruments.

MR. MASCI: Certainly today boiling instruments is considered a second choice. Steam sterilization performs so effectively and so much more rapidly that certainly every hospital can afford one steam autoclave.

If there is no other alternative, then there are a number of precautions which should be adopted to make boiling water sterilization of instruments more effective. One thing to remember is that boiling water will kill all but a few very resistant spores in about 30 minutes of free boiling at 212° F. In the higher altitudes in the West and the Midwest, one runs into the problem of a lower boiling point of water, and in places like Denver, water may boil at a mere 200° F., I am informed.

That fact poses a very considerable problem and should be reason enough for not considering boiling-water sterilization of instruments at all. Under those conditions, at 200° F., it would require at least 60-70 minutes to reproduce the same condition obtained at 212° F. in 30 minutes.

With those few words, I would say, prepare the instruments very carefully for boiling-water sterilization by cleaning them thoroughly of all organic matter, grease, and oil. Be sure that they are completely submerged in the sterilizer. The addition of alkali to lower the hydrogen ion concentration is desirable, inasmuch as the time for sanitizing can be reduced from 30 minutes to 15. Sal soda is added to the sterilizer to make a two percent solution or lye to make a 0.1 percent solution.

Q. Miss Horvat, how can we prevent the charring of materials in a hot-air oven?

MISS HORVAT: Cotton material will char at 200° C., and the important thing to remember when sterilizing anything with cotton or gauze stoppers is to maintain the temperature at 160° C. for two hours and not allow it to go any higher.

Q. What would you say is the best way to treat materials used in a contaminated case? Pathogenic organisms, such as the tubercle bacillus?

DR. CHANDLER: Linens, instruments, and other material contaminated with the tubercle bacillus should be autoclaved. Floors, pans, etc., are best disinfected with the various phenolic soap mixtures.

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8. The use of bacterial cultures for the control of sterilization is impractical because the incubation period is too long. See detailed discussion in Chapter VIII, *Aseptic Treatment of Wounds*.—ED.

9. Chemical disinfection of instruments and needles should be abandoned in favor of heat sterilization because of the danger of transmission of homologous serum jaundice.—ED.

10. Linen from a contaminated case can be safely handled without autoclaving if the following technic is observed: The soiled linen must not be allowed to dry for prolonged periods of time. The contaminated linen and the bag in which it is contained are dumped into a washing machine, which is filled with cold water and run for 20 minutes to take out blood stains and leach out the proteins. Water softener and soap are then added until there is a good head of lather. Three percent excess soap is next added to provide a minimum pH of 11 to insure sterilization. The water is heated to boiling, and soap is added a second time to make a good head of lather. The clothes are then rinsed and finished along with the other hospital laundry.—ED.

As far as linens are concerned, they should be autoclaved, even before they're laundered.[10] As a matter of fact, autoclave everything possible. That's the safest way to destroy organisms.

Instruments which cannot be subjected to heat and which are contaminated with tubercle bacilli may be sterilized by exposure to Chlorpactin, which, I am told by the Trudeau Laboratory (the National Tuberculosis Association laboratory), is very effective as a tuberculocide. This laboratory has recommended it for use with bronchoscopes, saying it will not destroy the cement. If tetanus, gas bacilli, etc., are the contaminants, you *must* use heat. You can't take the chance of disseminating those things throughout your surgery.

MR. ENGLER: I'd like to take this opportunity to bring in the question of sterilization of contaminated instruments, which Dr. Chandler mentioned. There is available the instrument washer-sterilizer, which is especially designed to take care of instruments which have been contaminated, without danger to the person handling them.

Q. If you have more instruments on an instrument tray, do you autoclave it longer than you do a small load?

MR. ENGLER: We always time sterilization by reading the thermometer which is located in the air and condensate discharge line, which is the coldest part of the sterilizer. Start timing the sterilizing cycle when that thermometer gets up to 250° F., or, if you're using high-pressure sterilization of instruments, 270° F.

Q. Mr. Engler, would you go ahead and give the sterilization time on linens, hardware, glass, rubber goods, and so forth, from the time you start timing?

MR. ENGLER: On linens, in properly loaded sterilizers, packaged as discussed previously—30 minutes at 250° F. On hardware, 15 minutes, at 250° F.

Q. Unwrapped or wrapped?

MR. ENGLER: That's unwrapped instruments and hardware.

Q. How about glass, unwrapped?

MR. ENGLER: If it's placed in the autoclave in the proper manner, in such a way that air can escape freely from the container, 15 minutes at 250° F.

Q. How long for rubber goods—the same?

MR. ENGLER: Rubber goods—15 minutes at 250° F.

Q. If instruments are wrapped, how long?

MR. ENGLER: Minimum of 15 minutes.

Q. Miss Horvat, do you agree with these?

MISS HORVAT: I don't think anyone will ever agree. I think everyone has pretty much her own system on timing.[11]

Q. How long can muslin-wrapped packages be considered sterile if they are stored?

MISS HORVAT: I'm afraid to say again, because I'm sure there will be wide discrepancy of opinion, and there are too many factors involved to permit me to give a blanket opinion.

MR. MASCI: Since I'm not an operating room supervisor, I can speak a little more freely, because I don't have to face a lot of angry people afterward. Generally, it is conceded that dry goods shouldn't be stored more than two weeks. The problem is very difficult, however, because it involves whether or not the packages have been so wrapped as to control the bacteria that might re-enter the package from breathing, due either to handling or atmospheric changes. For that reason it is very difficult to say whether a package is going to last three weeks, three months, or three years. Conceivably, it can do any of those.

As a safety precaution, just in case the wrapping is not quite the best, certainly a two-week period seems reasonable.

Q. What material do you recommend for cloth covers, and why?

MR. MASCI: For dry goods supplies for covers on instrument trays, and similar uses, we recommend two thicknesses of muslin—muslin, because tighter fabrics interfere with the displacement of air by steam, and because it seems fine enough, particularly with two layers, to prevent recontamination through the fabric for an appreciable length of time. That doesn't mean that a pack has to be wrapped with two pieces of muslin. If the wrapping is wide enough so that there are at least two thicknesses at any one spot, it will be adequate.

Q. How many minutes do you recommend sterilizing large metal drums packed with linen?

MR. MASCI: I could hedge that and say it depends on how large the drum is. But you already know that! I can't answer, because it depends entirely on how the drums are packed, what kind of drums they are, and half a dozen other factors which I can't even guess at. However, I think I can indicate what things are important, so that perhaps you can decide for yourself.

On older-type drums which had one or two rows of holes concentrically, the length of time required to get the load up to temperature was astonishing. With the modern drums that are pretty well fenestrated, the delay is not quite so great. However, there may be as much as a 50 percent decrease in the rate at which you can displace the air.

Because all these things are variables, I believe that the only way you can get a satisfactory answer to this is to work out a technic with your own drums and your own sterilizer, using cultures to establish what length of time is satisfactory, and then stick to that routine.

Q. If no hot-air oven is available, what would you suggest for dry-heat sterilization?

MISS HORVAT: I would recommend the use of the ordinary dressing sterilizer. The technic for using it for dry-heat sterilization is as follows: Load the sterilizer as usual; close the door and turn the steam into the jacket *only*. The chamber will heat by radiation. The exposure time is four hours at 250° F. A convenient technic is to load the sterilizer as described and leave the load in overnight.

Q. What agent or disinfectant do you recommend for use in a TB hospital? What chemicals are recommended to disinfect rubber goods used on known tuberculosis cases —example, anesthesia equipment, intertracheal tubes, and so forth? How do you sterilize bronchoscopy instruments? Do you think all bronchoscopy cases should be considered potential TB cases and treated accordingly?

DR. CHANDLER: Chlorpactin, which I mentioned earlier, is obtained from the Guardian Chemical Co., 10 43rd Ave., Long Island City, N.Y. When I knew that I was going to be on this panel, I corresponded with the Trudeau Laboratory, which recommended this agent. I also corresponded with Dr. Smith at Barlow Sanitarium, who has been considered an authority in the tuberculosis field for many years. He still feels that alcohol is a good antitubercular

11. What is the time required to destroy bacteria? Do not forget this common factor in the problem.—ED.

agent and continues to recommend its use. He also states that one of the phenolic soap compounds, orthophenylphenol, is an excellent agent. "It has recently been shown," according to Dr. Smith, "that the alcohol-formaldehyde mixtures are not as efficient tuberculocides as they used to be considered to be. They're not completely condemned, but they don't stand up there where they used to." Now here's a question that follows that statement:

What type of alcohol and percentage is used for the control of tubercle bacilli?

Dr. Philip Price, at the University of Utah, has done the most work in the study of bacteriostatic and bactericidal actions of alcohol. I don't recall that he ever specified any particular concentrations to be used against the tubercle bacillus, but as a general germicide, he says that any concentration between 50 percent and 90 percent is effective. Most institutions I know use 70 percent, because early work showed that apparently that was the most effective concentration. However, Dr. Price has done much work and has shown that anywhere from 50 to 90 percent is satisfactory.

I'd like to remind you again that it need not be ethyl alcohol. Isopropyl alcohol is just as effective, at 50 to 90 percent concentration. There's of course a distinct advantage to using isopropyl alcohol—the Revenue boys don't have to be contacted on it, and it's a lot cheaper.

Q. How do you sterilize syringes used in infectious hepatitis?

DR. CHANDLER: Sufficient heat will do the job. You realize that hepatitis is caused by a virus which cannot be demonstrated in animals and cannot be cultured. The only way you know whether it exists or not is when it shows up in man. And we can't be running around using people for guinea pigs to find out whether we've destroyed the agent or not.

There is no evidence that the virus has been transmitted when sufficient heat sterilization has been used.

One should be very careful of needles, to use heat sterilization after they've been used on one patient and before they are handled by workers, to prevent transmission of infectious hepatitis from patient to patient.

Blood lancets, employed by technicians, also can carry the infectious agent.

Q. In sterilizing goods—drains and so forth—in boats, are they sterilized with lids on or off?

MISS HORVAT: When sterilizing shallow boats, leave the lids off. Whenever sterilizing any container, take off the lid, because air trapped in the can is a poor conductor of heat. Also the lids should be off all bottles when they are being sterilized.

Q. Can syringes be sterilized by leaving the plunger and barrel assembled and covering the tip with a plastic cover?

MISS HORVAT: I have not become too acquainted with this method, but according to the literature available syringes can be sterilized unwrapped, with just the plastic tip.

Q. What would you consider the best agent for sterilizing heart catheters?

MISS HORVAT: Heat would be the best. It depends on the type, whether plastic or something else.

Q. How soon can gloves be worn after being sterilized?

MR. ENGLER: Sterilized by steam sterilization, I presume—as soon as they cool off.[12]

Q. How can I prevent rubber gloves from becoming tacky in autoclaving?[13]

MR. ENGLER: One thing I would like to say about the question of sterilization of rubber gloves has to do with the proper packaging of rubber gloves for steam sterilization. Rubber gloves should be washed, dried, and powdered, and then in order to get the steam into the interior of the rubber glove it is necessary to keep the glove surfaces separated. A gauze pack is positioned in the glove to provide free access for steam.

If you will do that, and if you'll put the gloves in the specially designed folders, with the thumbs up, so that the air can flow out naturally, you'll find that you get very effective sterilization of the rubber glove at a time and temperature that will not damage the gloves. I think that most gloves which become tacky have been subjected to too high a temperature for too long a period of time, and also have been subjected to too many sterilizations and have almost served their useful life.

Q. How long should nylon scrub brushes be autoclaved?

MR. ENGLER: I would say 10-15 minutes.

Q. How do we have superheated steam, and why do we have it in the autoclave?

MR. ENGLER: That's quite a question to answer briefly. There is a possibility of having a certain degree of superheated steam. If I were to go into the physics of it, it would take quite some time, but I'll say this: The only time that you will have superheating effect is if you put the dressings in the autoclave and leave them in there without any steam in the chamber until they become very desiccated—free of moisture, entirely dry. Then at the time you first admit steam into the chamber you will have such a rapid absorption of the steam by these desiccated fibers that you would be able to measure with a very sensitive thermocouple and potentiometer a little flash of temperature in excess of what you'd normally get at, say, 20 pounds steam pressure in the jacket or 260° F.

Freshly laundered wrappings have enough moisture so that this superheating effect is avoided.

Q. What about sterilization of syringes? Should one end or both ends be closed? Should they be sterilized in open pans, or with the barrel in, or the barrel out?

MISS HORVAT: I think that here, as in other things, there is a wide discrepancy of ideas, but ordinarily it's recommended that the barrel and plunger can be put together and sterilized in syringe boxes, providing they are moistened before they are placed in the boxes. By following this procedure, one is assured of satisfactory sterilization.

For sterilizing syringes in sterile tubes, the same procedure is used—barrel and plunger are put together, and the syringe is moistened before placing in the tube. I think the best way is to separate them to get effective sterilization.

Q. Is it possible to sterilize wooden blocks for shaping bone grafts? If so, how? The questioner means a square of wood that is to be used to cut bone or cartilage right in the sterile operation.

MISS HORVAT: I would probably wet the block, wrap it in muslin, and sterilize it at 250° F. for 30 minutes.

MR. MASCI: I should think the best way to handle the little wooden blocks would be to autoclave them. They

12. Rubber gloves imbibe water during sterilization and should be allowed to dry out for 48 hours after sterilization to regain their tensile strength.

13. Tackiness in rubber gloves can be attributed to many things. All traces of quaternary ammonium compounds should be rinsed off immediately after the gloves are removed. Avoid contact with grease and oil. A small quantity of Bio-Sorb in the rinse water when the gloves are being processed will do much to eliminate the tackiness. Avoid strong detergents when washing rubber gloves; a mild soap should be used.

carry enough moisture within them so that autoclaving at 250° F. for 30 or 40 minutes should be adequate.

Q. If Chlorpactin is so effective for tubercle bacilli, would you advise using this for chemical sterilization wherever such sterilization is indicated?

DR. CHANDLER: I have not investigated the activity of this agent. It was recommended by the Trudeau Laboratory, as I reported. However, knowing that it is an effective tuberculocidal agent, I'm sure that it could be used for the eradication of the common pathogens, the less resistant types of bacteria. I don't have any idea about its activity as a sporacide.

Q. Do you think all bronchoscopy cases should be considered potential TB cases and treated accordingly?

DR. CHANDLER: I haven't any idea of the incidence of TB among those cases. I think your physician should be able to guide you in that respect.

Q. What do you think of a formaldehyde cabinet?

DR. CHANDLER: Formaldehyde gas requires, for sufficient sterilization, a long exposure time, and I think that the cabinets do not provide proper conditions.

Q. Do you feel that cold sterilization of knives and scissors is safe and sufficient?

DR. CHANDLER: No!

Q. How long must one sterilize sharps, having steam only in the jacket of the steam autoclave?

MR. ENGLER: I assume that the questioner means that there's going to be only jacket pressure—no steam in the chamber. Then, if you have 20 pounds steam pressure in the jacket, and all air eliminated—no air-steam mixture—you would have the equivalent of 260° F. Under those conditions with no steam you would have a dry-heat or a hot-air oven. I would not like to depend on sterilization by dry heat at 260° F.; 320° F. has been recognized as the temperature required for killing the spores and bacteria under dry heat.

Aseptic Technic in Central Supply

By Mildred E. Dodge, R.N.*

OUR hospital is a 900-bed hospital for general medicine and surgery, with a small section for psychiatric patients. About three years ago a staff was assigned to head up supplies, get the layout of the hospital, and equip the nursing unit.

When I arrived and found that the central service unit covered two-thirds of one floor, I was overcome. The autoclaves looked like the vaults of the First National Bank, and storage space was tremendous. The department had been built to be a comprehensive central service unit—to meet the sterile supply needs for the entire hospital.

It was quite an undertaking to consolidate the needs of all services—the nursing units, surgery, the laboratory, blood bank, the animal laboratory, x-ray, and research, for example.

Today, with our central supply section running quite smoothly, there is a centralized area for the control of all sterilization, because the autoclaves are producing bacteriologically safe goods for the entire institution. A comparatively small staff of highly specialized aides is required to do this type of work, and there is no duplication of this group elsewhere in the hospital. This staff is compensated in salary with a rating which recognizes the staff members' responsibility and their value in the efficient care of the patient.

Bacteriological tests are run monthly on all the autoclaves, thus assuring sterile goods. Planned inspection of all this equipment is carried out at the same time by the hospital maintenance division to ascertain that it is functioning properly.

Ample storage space and closed cabinets assure protection to all sterile items.

The operating room supervisor is no longer concerned about laparotomy packs, solutions, surgeons' gloves, or any of the numerous items used in surgery every day. Her staff is only responsible for assembling the various kits to be used for the operating room schedule the next day. Each scrub nurse sends her prepared tray down to central supply by dumb waiter the evening before it will be used in surgery. The central supply personnel will sterilize it and dispatch it back to surgery later that evening.

The central supply staff is aided tremendously by good equipment. However, paramount is the fact that the staff is trained in the right way to clean instruments, to package, and to load autoclaves to aid in the bactericidal efficiency of a steam autoclave.

Under close supervision of professional nurses (there are graduate nurses on duty 16 hours out of the 24), the staff is responsible for cleaning, assembling, and sterilizing all the therapeutic and diagnostic trays used throughout the hospital, the syringes and needles, the surgeons' gloves, dressing kits, and the irrigating trays and irrigating solutions for the genitourinary section.

There are no short-cuts in cleaning. There can be no possibility of bacteria lurking on instruments in Vaseline or oil—or, perhaps, of locking instruments being put into the sterilizer locked. Staff members are well aware of their responsibilities, and as a unit are very proud of the part they play in the total care of the patient.

We are fortunate in having some very good volunteers who are taught to package the hundreds of items that will be sterilized and issued to the nursing units. They have practically become part of the staff. They have become quite efficient in packaging towels and gloves, and often aid in setting up packs. They are experienced, reliable, and a tremendous help.

*Miss Dodge is central supply supervisor, Boston VA Hospital.

Notes on the Characteristics, Composition and Care of Rubber Materials Used in Medical Goods

By R. Douglas Sanders, M.D., and James P. Aikins, M.D.
Wilmington, Del.

Instruments and parts fabricated of rubber make up a considerable part of the expense of an anesthesia department. These are deteriorating items which can hardly be expected to last indefinitely. However, the exertion of intelligent care can greatly prolong their useful life.

Four elastomers are in current use in manufacture. They are natural rubber, neoprene, butadiene styrene and butadiene acrylonitrile. The latter three of these are synthetic with neoprene and butadiene styrene being used widely in medicine.

General characteristics:

	OXIDATION RESISTANCE	OIL RESISTANCE	TENSILE STRENGTH	RESILIENCE
Natural rubber ([C_5H_8]) +) (Polyisoprene)	Fair to good (depending on antioxidant)	poor	Excellent 5000 lbs. sq. in.	excellent
Neoprene (Polychloroprene)	good	good	Good 4000 lbs. sq. in.	good
Butadiene styrene	good	poor	Fair 1500 lbs. sq. in.	fair

Natural rubber as it comes from the tree contains a varying percentage of resins and proteins, whereas the others, being synthesized materials, contain no such extraneous matter.

Semi-transparent articles are much more easily manufactured from natural rubber; elasticity and "feel" are also superior. Where oil or oxidation resistance is necessary, however, neoprene is far superior. Characteristics vary somewhat according to the other ingredients used in compounding.

A typical compound for semi-transparent goods will consist of:

Natural rubber	100	
Sulfur	1.5	necessary to formation of cured rubber
Zinc oxide	2	facilitates cure
Accelerator	0.25-2	speeds curing process
Antioxidant	1	reduces oxidation

Typical accelerators are:

Mercaptobenzothiazole or its zinc salt

Zinc salts of dimethyl, diethyl, or dibutyl dithiocarbamic acid

Piperidine pentamethylene dithiocarbamate.

Typical antioxidants are:

Diamyl hydroquinone

Ketone + amine condensation products

Diorthotolyl guanidine salt of dicatechol borate

Substituted phenols.

Additional substances that may be added for especial purposes are fillers such as clay and carbon black; plasticizers, pigments, wetting agents, etc.

The most frequent intrinsic sources of so-called allergies to rubber are the accelerators and antioxidants. Extrinsic sources are bacterial or chemical contamination due to inadequate or improper sterilization after use.

Common substances causing deterioration of rubber:

Mineral oils—swelling, tackiness, final deterioration

Vegetable oils—swelling, tackiness, final deterioration

Ethers—swelling, final deterioration

Esters—rapid swelling, final deterioration

Oxidizing acids—rapid deterioration

Hydrocarbon solvents—rapid swelling and loss of strength

Copper and manganese—ionic concentration of .001 percent causes rapid catalytic decomposition

Phenols and cresols—stickiness and final disintegration

Ozone—even small concentrations cause severe cracking.

All these effects occur more rapidly in rubber that is left in a stretched state or continuously subjected to heat.

Water swells rubber but does little damage after drying. Alcohols cause little immediate damage. Alkalies, even very caustic ones, have very little effect. Mercury salts do no particular harm.

THE CARE OF RUBBER ARTICLES

To obtain maximum useful life from medical rubber materials the following points should be observed:

1. Remove metal connectors immediately after use.
2. Wash with soap and water. Do not use detergents or soaps containing cresol or unreacted hydrocarbon solvents.
3. Powdering to prevent tackiness may be done for articles that must be stored or steam sterilized in intimate contact with each other. For this purpose talc, zinc stearate, or starch may be used. However, one must always remember the danger of contaminating wounds or the respiratory tract with these substances.
4. Do not boil in brass or copper sterilizers. Do not use permanganate solutions.
5. Avoid all contact with animal or vegetable oils. If accidentally contaminated, wipe off with gauze saturated in acetone and wash with soap and water.
6. Avoid contact with cresols, phenols, terpenes, hydrocarbon solvents, esters, chlorinated hydrocarbons, and oxidizing acids.
7. Store in the dark away from sources of ozone generation such as fluorescent lighting fixtures, electric motors, and diathermy machines.

Flask Technic for Sterile Surgical Fluids —A Guide to Planning

by
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Nurse Consultant

Division of Hospital Facilities
Public Health Service
Department of Health, Education, and Welfare

● The use of hermetically packaged sterile distilled water or isotonic sodium chloride solution USP in hospital operating rooms, delivery rooms and nursing units instead of sterile water from water sterilizers is a recommended technic. To effectively introduce this technic requires the following steps:

I. Prepare an estimate of the quantities of solutions to be used.

The approximate daily requirement of flasks of isotonic sodium chloride solution and/or sterile water in hospital *operating rooms* and *delivery rooms* for hot packs, irrigations, and hand basins is 3-5 liters per operation and 4-7 liters per delivery.

The following charts based on 4 liters per operation and 7 liters per delivery shows the approximate daily number of flasks of sterile water and/or isotonic sodium chloride solution for hospital *operating* and *delivery* rooms:

Number of flasks of sterile water and/or isotonic sodium chloride solution for the *operating* and *delivery* room suite at 4 liters per operation and 7 liters per delivery:

Hospital Size	25	50	100	200
No. operations	2	5	10	20
No. births	1	2	3	6
Total—liters of solution	15	34	61	122
No. flasks				
2 liter flasks	6	13	24	48
1 liter flask	3	8	13	26

Number of flasks of sterile water and/or isotonic sodium chloride solution for the operating room suite at 4 liters per operation:

Hospital Size	25	50	100	200
No. operations	2	5	10	10
Total liters	8	20	40	80
No. flasks				
2 liter flasks	3	7	15	30
1 liter flasks	2	6	10	20

Number of flasks of sterile water and/or isotonic sodium chloride solution for the delivery room suite at 7 liters per delivery:

Hospital Size	25	50	100	200
No. births	1	2	3	6
Total liters	7	14	21	42
No. flasks				
2 liter flasks	3	6	9	18
1 liter flasks	1	2	3	6

In addition to the operating room and delivery room requirements, there is a small additional requirement for use on the nursing units, out-patient and emergency services.

II. Provide an area to prepare the solutions.

Surgical fluids are usually prepared in either the pharmacy or central supply department. If the hospital manufactures parenteral solutions, the surgical fluids should be prepared in the same area and should utilize the same equipment. If the hospital does not manufacture parenteral solutions, special provision must be made for surgical fluid preparations in either the pharmacy or central supply—preferably the pharmacy.

III. Provide equipment to prepare, sterilize, store and warm the solutions.

A. Preparation and sterilization equipment.

1. Water still with heat resistant glass storage carboy

[1] The term sterile surgical fluids is used to denote sterile water and/or isotonic sodium chloride solution USP for hot packs, wound irrigations or moist surgical dressings.

2. Recording conductivity meter
3. Hot plate
4. Double compartment sink
5. Counter
   a. Unclean equipment
   b. Clean equipment and flasking
6. Cart—transporting and sterilizer loading
7. Bottle washer[2]
8. Flasks, glass, heat resistant, 1L—2L, and hermetically sealing caps
9. Scale—metric solution
10. Steam pressure sterilizer (autoclave) with corrosive resistant lining
11. Storage cupboards for equipment and supplies
12. Cart—flask drainage[2]
13. Closed system solution equipment—filtration and filling[2]

B. Provide storage space for the solution flasks.

Cabinets or cupboards are required in a central area, i.e., central supply or pharmacy, and in every hospital unit where solutions are used.

1. Central supply or pharmacy

   Sufficient storage space for a reserve stock of solutions must be provided in the central supply or pharmacy storage area. The storage space should accommodate at least a 24 hour supply of solutions. However, it is considered practical to prepare solutions not oftener than once or twice a week. Thus, a 100 bed hospital preparing solutions twice a week would require central storage space for approximately 90 liters.

2. In the operating and delivery suite.

   Storage cabinets must be provided in each operating room and delivery room or the adjacent sub-sterilizing room for a 24-hour quantity of type solutions required. Example, a 100 bed hospital with 4 operating rooms using a daily average of 40 liters of solutions daily would require cabinet space for 10 liters of solution in each operating room or cabinets for liters of solutions in the sub-sterilizing room between each two operating rooms.

3. On the nursing units, outpatient, and emergency departments.

   Some solution storage space must be provided in the clean utility room and treatment rooms.

C. Warmers

Solution warmers are required in each operating and delivery room or adjacent sub-sterilizing rooms.

IV. Assign personnel to the solution area.

Personnel provision must be made in the department preparing the surgical fluids. It has been estimated that it takes approximately 4 labor hours to prepare, sterilize, store and deliver 60 liters of solutions.

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[2] Recommended in hospitals of 200 beds and over.

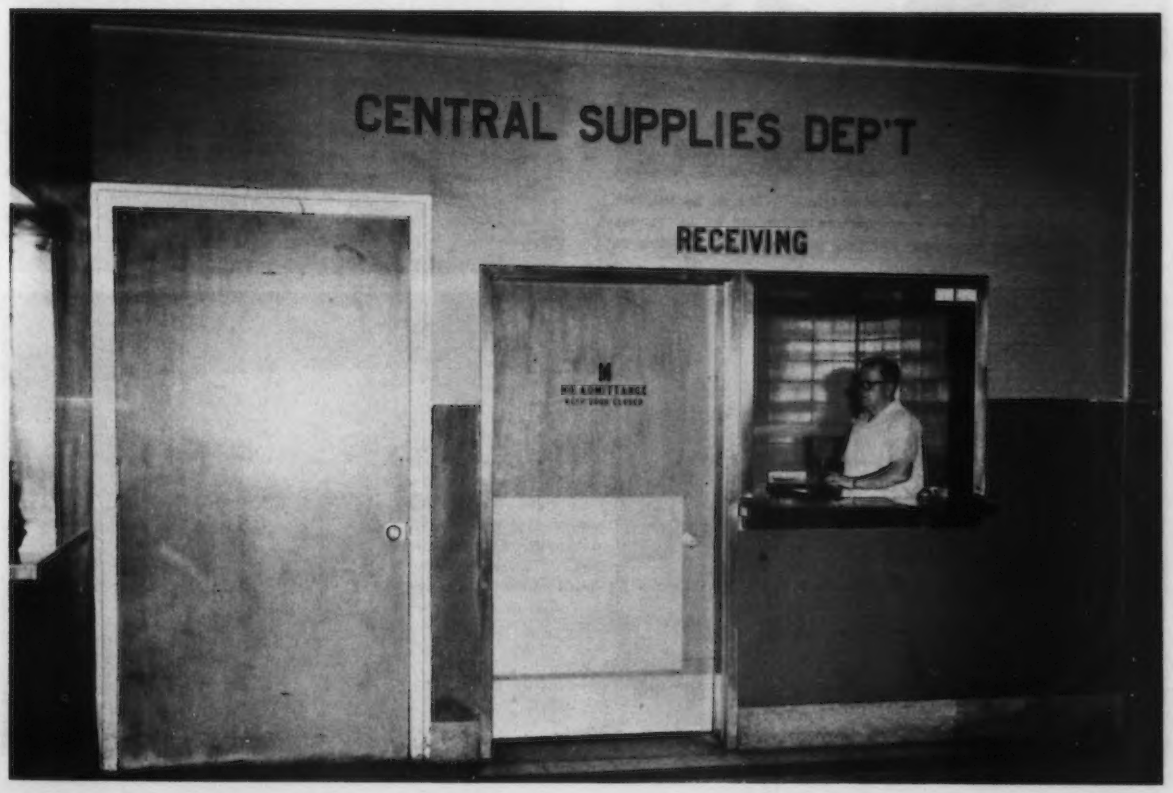
C. S. at Cook County Hospital a Major Operation

When a hospital is over five times larger than what would ordinarily be termed a "large" hospital, its central supply department becomes not merely a service, but a major operation.

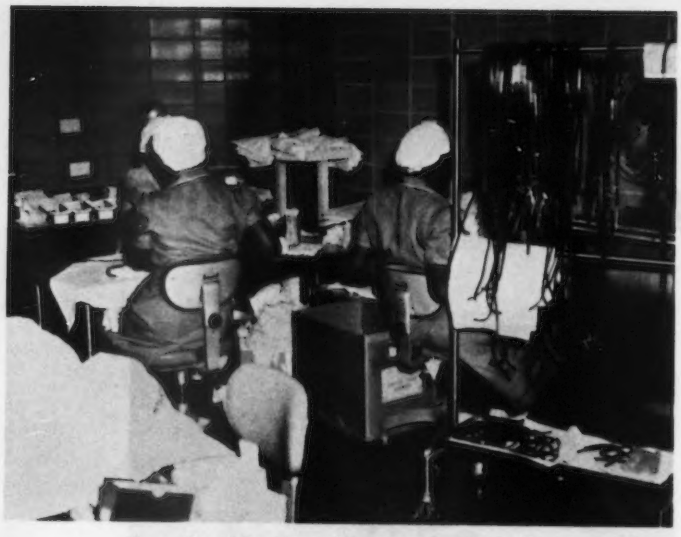
The newly modernized central supply department at Chicago's 3,260-bed Cook County Hospital, for example, has a daily linen count that runs into the thousands. Where the average central supply room might process a few hundred rubber gloves per day, the department here is equipped to process a few hundred per hour. Bandaging is ordered not by the pack (except for the sterile, fine-mesh type), but by the bolt. Each bolt is run through a loom-like machine which cuts it into various bandage widths. These bandages then are packaged according to size in dozen lots. About 400 such lots are packaged per month.

Rooms in the department are designated not by number, but by letter—and they use up half the alphabet, A through M. Practically each of these 13 rooms is larger than the entire central supply department in most hospitals.

Above: Strips used as ties for gowns and surgical masks are bought in rolls and cut to size. About 15 or 16 strips are cut at a time.



Below: A corridor view of Cook County's central supply department. Seen through the window is William C. Brunner, R.N., supervisor.



Above: IV and hypodermoclysis sets are washed and hung on racks to let the water drip out of the tubing. After they have been examined and processed, they will be wrapped in muslin and autoclaved.

Above: Bandaging used for non-sterile purposes is bought by the bolt and run through a bandage-cutting machine which can be set to any width. After bandages have been cut they are packaged according to size in one-dozen lots.

Formerly the hospital's central supply department was located on three different floors. With the opening of the newly modernized department in April, however, the rooms now are located all on the same floor and are conveniently adjacent to one another.

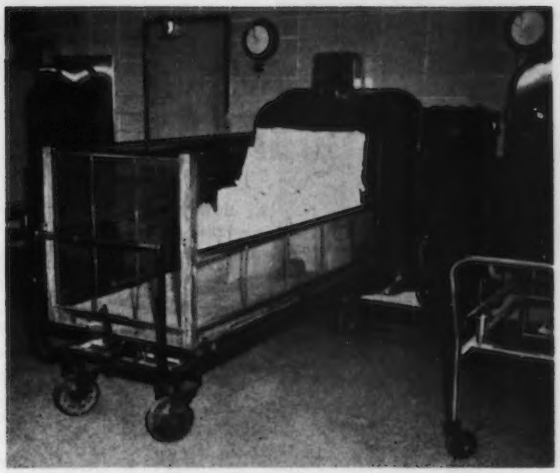
Requisition books provided to each ward, for the purpose of ordering supplies from the central supply department, also are labeled with letters—A through I. The most important items are listed in book A; less important items in books C, D, E, and so on, down the line to the minor items listed in book I. Book "B," incidentally, is used solely for write-in items—special articles, or items so new that they have not yet been listed on the regular forms.

For all of the department's vast size, however, and its huge daily volume of turnover in supplies, it operates with smoothness and efficiency. Breakage and loss of the numerous items which daily flow in and out of the department is almost negligible. Out of 858,571 syringes of all sizes dispensed during 1953-54, only 12,055, or about 0.14% were broken or lost. Breakage and loss of most other items was even lower. William Brunner, R.N., supervisor of the department, attributes this fine record to incessant teaching, conscientious checking on carelessness, and efficient packaging.

The hospital, administered by Warden Fred A. Hertwig, serves an important function as a teaching institution in the Chicago area. Hence, it is necessary that the central supply department be perpetually abreast of the newest trends and procedures in the field. In-service staff education programs are carried on continually. Meetings, at which staff members are encouraged to freely thrash out their problems, are held twice a month for all associational and professional personnel. An outstanding authority on some new trend or procedure in the field is presented at each meeting to keep the staff members informed of new developments.

A pictorial review of Cook County Hospital's vast and modern central supply department is continued on the following page.

Below: Rubber gloves, which formerly were washed manually in the individual wards, now are washed in the department's three Westinghouse laundromats. After gloves have been loaded in machine (each machine holds 200 gloves), they are given a ten minute prewash followed by a regular washing with warm water and detergent. Speedup in washing afforded by the machine enables the department to turn out 1,500 gloves in five and one-half hours.



Left: Standing at the entrance to a huge autoclave is one of the department's linen carriers. After the carrier has been fully loaded, it will be rolled into the autoclave and linens will be sterilized without being removed from the cart.

Right: An attendant (at Cook County non-nursing personnel are called attendants rather than aides), prepares catheters for autoclaving. Each catheter is placed in cellophane tubing and labeled with a ticket which states its type and size.

Left: All clean and sterile supplies are stored in the department's vast dispensing room. All incoming orders are received and filled here.

Right: Syringes, hypodermoclysis, IV, and special sets (irrigating, "Y" IV, and respirator IV), as well as instruments used for minor surgery, all are cleaned and processed for sterilization in one large workroom. Attendants seated at table are processing syringes.

Gadgets Improve Efficiency of CSR at Mt. Sinai

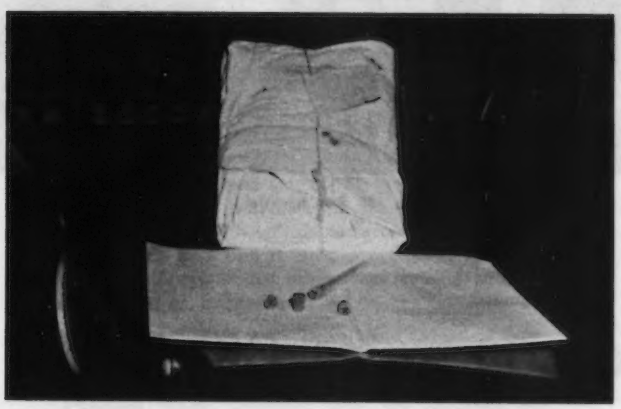
● When Mount Sinai Hospital, Miami Beach, Fla., decided to revise its central supply department, Marie Oscar, assistant director of nursing, was put in charge. She worked out an up-to-date, well-organized department that any supervisor would like to have. The supervisor, Mrs. Ruth Lyons, has added many gadgets of her own design to improve the department's service. Some of them are shown here in HOSPITAL TOPICS' pictures.

Above: The hospital's engineer built the rack for holding gastric tubing. All rubber goods not autoclaved are kept in a closet, to protect rubber from destruction by heat and light.

In picture at right, Mrs. Lyons (l.) shows student practical nurse colored cotton balls which indicate different sizes of needles. Drawers under counter provide handy storage space for needles, syringes, Burdett adapter, other small equipment.

Below, at left: Surgeons like the surgical dressing set designed by Mrs. Lyons and made by the linen department. With the set, which has separate pockets for each instrument, there is no excuse for dropping instruments or losing them. Also, it is easier to check instruments back in. Contents are: sharp and blunt scissors, hemostat, probe, plain tissue forceps, tissue forceps with teeth, four 4x4's, and some cotton balls. Mrs. Lyons believes in re-using supply containers. A 4x4 bag holds supplies that don't have to be sterile. The end piece of cardboard from the bag is also saved, and may be used to make a notation of something missing from a tray. An old adhesive tape container holds a spinal manometer, wrapped in a towel.

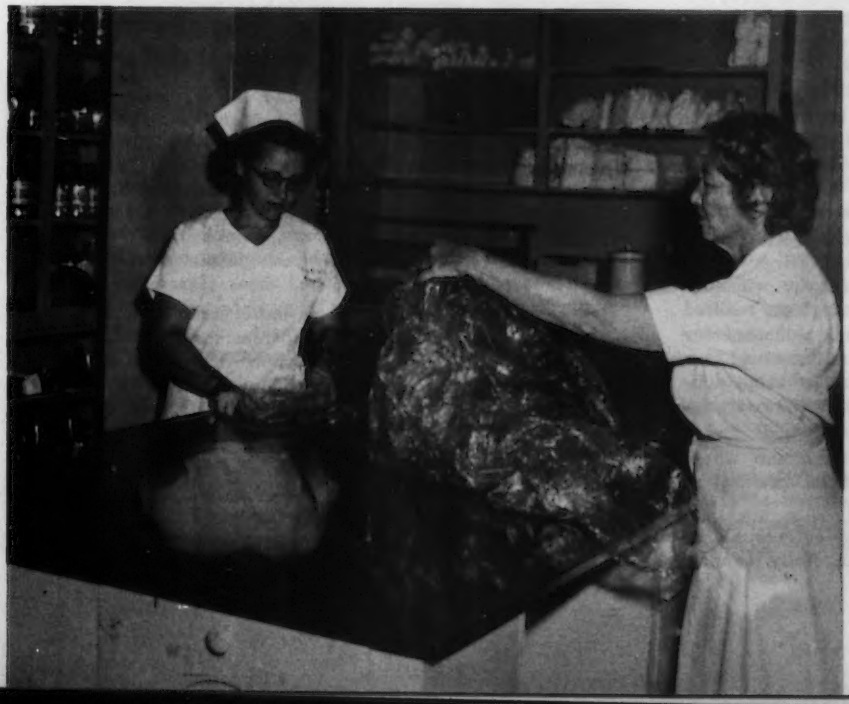
Right: "Blow bottle"—old idea being revived — is demonstrated by Mrs. Lyons. A 500cc. used IV bottle is filled with colored water. Bits of IV tubing and glass rods complete the gadget. Postoperative patients are asked to blow into the bottle, to expand their lungs and prevent atelectasis. Bins under counter hold material for making up trays.

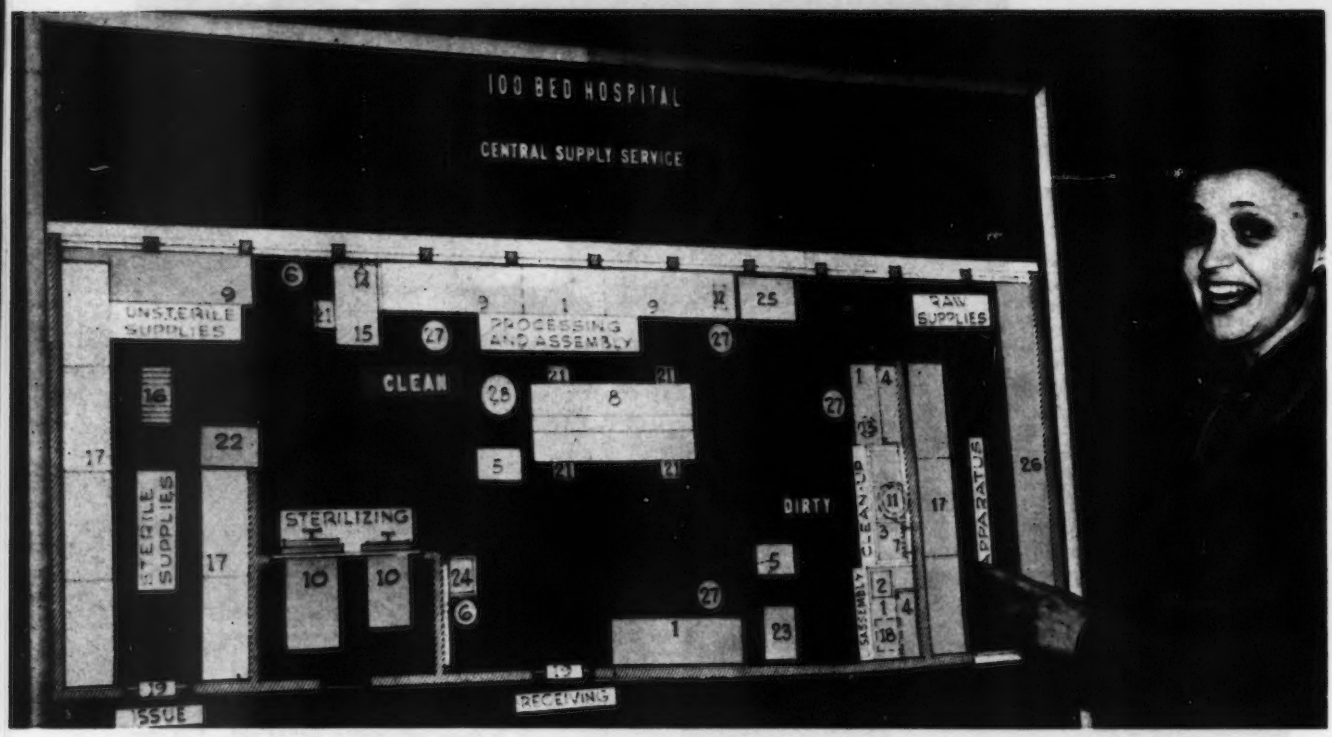


Left: Gummed labels shown on outside of wrapped spinal tray are put on individual tubes to identify for laboratory tests. Numbered corks shown in foreground correspond with the tests taken, and the nurse has only to remember to put the right corks into the right tubes.

Below: Gastric suction tray, devised so that everything needed would be right at hand, is shown with gastric suction unit. Tray contents: choice of gastric tube, treatment basin, small emesis basin, 50cc. syringe, Burdett adapter, two safety pins on a 2x2, four four-inch pieces of ½-inch adhesive tape on a tongue blade, a Hoffmann clamp, and a small box of wipes.

Below: Mrs. Lyons and volunteer worker Mrs. Dorothy Fleischner cut up old oxygen tent to make large squares, to protect linen. Squares may be used to protect outer dressings in colostomy or prostatectomy cases.





Above: Author Schafer points out a floor plan for a central supply service in a 100 bed hospital.

Central Supply = Economy and Efficiency

The advantages of centralization are *efficiency, economy, and education.*

Centralization promotes *efficiency* through good supervision of cleaning, maintenance and sterilization of material! More exacting technics are possible when functions are performed by a few trained persons whose primary function is supplies and equipment. It is also easier to maintain standardization, uniformity, and coordination of material and procedures throughout the hospital.

Better patient care results because professional personnel are assured complete supplies and equipment without having to devote time to the preparation, and patients are not annoyed or do not suffer from incomplete, poor functioning, or improperly cleaned or sterilized materials.

A central system is economical because better maintenance and supervision of material processing lessens breakage and deterioration. Duplication of equipment infrequently used is avoided. Personnel savings are realized through better utilization of professional personnel for patient care activities. However, the actual personnel savings in a central system is accomplished by using nonprofessional personnel under supervision with assembly-line methods and mechanical equipment.

A central supply service also provides a unit where a good educational program in aseptic technic, organization and administration can be taught.

Some of the disadvantages or difficulties encountered in a Central Supply Service are that a carefully planned, integrated, administered system of procurement, processing, distribution, and accounting of material throughout the hospital is required. The supervisor must be familiar with the principles of aseptic technic, and able to organize and supervise procedures along "assembly-line" methods. Such a person is not always available.

There is also danger in spreading infection if organisms on septic materials are not destroyed at their source and kept out of clean areas.

A larger number of frequently used articles such as syringes, needles and instruments must be maintained in circulation, but the overall total expense is less. Transportation of supplies and equipment is time consuming, and may be inconvenient and impractical. Since the concept of "Central Supply" is still new, we still do not know at what point centralization reaches the point of diminishing returns.

In order that we may cover as much material on this subject in a very short time, we will consider some of the factors concerning a central supply, which must be considered when planning or programming the service. If you are now operating a central supply, this may be a review of your particular service.

Planning a Central Supply Service is complex because hospitals vary in services, materials used, and the degree of centralization desired or advisable.

When planning a new service it is always advisable to write the objectives of the department so all persons

involved now or in the future will understand what is proposed or was intended.

1. What department will be responsible for the unit? Very early in the planning stage it is advisable to determine where within the hospital organizational pattern the Central Supply Unit will fit. Because most of the materials supplied by the unit are used by or through the nursing department, that group usually is called upon to operate the unit. However, in some instances the pharmacist is given the responsibility for this unit. A procedure committee to determine needs and standards is also required. The three important points to consider are: (1) Services, (2) departments, and (3) materials.

2. What services are to be provided?
   a. Sterile supplies and equipment
      Hospitals vary, but most Central Supply Services include sterile supplies and equipment for treatments, surgical operations and deliveries. Routine patient care equipment is usually decentralized, but could be centralized effectively, especially in a small hospital. It is usually considered safer to decentralize the sterilization and disinfecting equipment and materials from septic or infectious patients. A system of centralization is possible, but has not been used sufficiently to recommend it at this time.
   b. Unsterile supplies and equipment, including individual items and assembled sets, can be effectively included in the Central Unit.
   c. Apparatus
      The maintenance and storage of apparatus such as oxygen tents and inhalators in the Central Supply, especially in small hospitals, is recommended. Larger hospitals may find it more practical to have apparatus storage under other departments such as anesthesia, or maintenance.

3. What departments are to be served and extent of service to each.
   a. Linen
      Although many hospitals have not included the preparation of linen packs for the operating room and delivery suites under Central Supply, it is now considered advisable to do so. Some sterile linen is also required for the in-patient and out-patient units. Linen inspection and folding is space and time consuming and influences area, equipment and personnel requirements.
   b. Dressings
      Surgical dressings and other gauze and cotton supplies for all units can best be handled through Central Supply.
   c. Gloves
      It is advisable to centralize all rubber glove processing and sterilizing. The laundry may wash and dry the gloves.
   d. Instruments
      It is usually not considered advisable to include operating room and delivery room instruments in the Central Supply because of numbers required, control, and the necessity for emergency sterilization. Instruments for treatment sets on patient units can be effectively centralized.
   e. Syringes and needles for all units can best be handled through a centralized system. Recent studies on the causes of infectious hepatitis have emphasized the importance of efficient sterilization of syringes and needles.
   f. Centralizing the processing of treatment trays and sets for all in-patient and out-patient units usually provides improved service.
   g. Unsterile supplies and equipment for the in-patient and out-patient unit to be considered include such items as non-sterile treatment trays, bandages, pads, hot water bottles, ice bags, heating pads, communion sets, and morgue sets.
   h. Operating Room and Delivery Room Suite apparatus are usually not kept in a Central Supply Unit. The apparatus usually stored in Central Supply includes such items as inhalators, suction machines, oxygen tents, and drainage equipment.
   i. Under other services we could include some drug or solutions service; but it is generally accepted that these should be included under the pharmacy.

5. What items will be purchased ready made?
   a. It is usually considered more economical for hospitals to purchase surgical dressings ready made.
   b. Parenteral solutions
      Manufacturing parenteral solutions in a hospital reflects a substantial monetary saving but for safety reasons should only be done under the supervision of a qualified pharmacist.
   c. Sterile disposable parenteral sets are now used by many hospitals and assures safety and personnel savings.
   d. Others

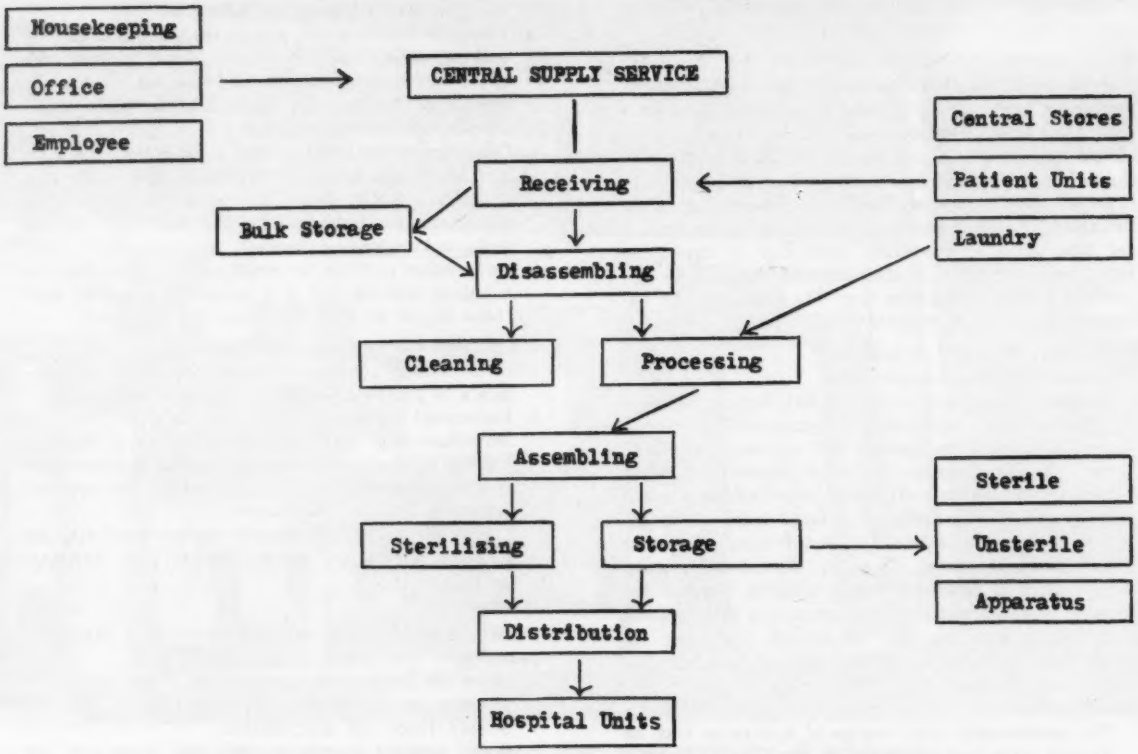
6. What preparation will materials receive in other departments?
   a. Some hospital laundries prepare linen packs for surgery and obstetrics and send them to Central Supply ready for sterilization.
   b. Some hospital laundries efficiently wash and dry rubber gloves, but doing them in the Central Supply Unit eliminates the necessity of transporting the gloves from one department to another and centralizes the entire procedure in one area.

7. How frequently raw supplies are received from central stores will determine the storage space required. Usually materials are issued to Central Supply about once a week in quantities required for the week or in carton lots as supplied by the manufacturer. The Central Supply Unit should not be used for a Central Store Room.

8. What method of distribution will be used, i.e., dumbwaiter, truck or messenger? Since any centralized service is only as effective as its distribution system, careful study and attention should be given to this aspect of operation. To provide good patient care, supplies and equipment must be available whenever and wherever needed with a minimum of delay. When a minimum stock of frequently used items are delivered to the various hospital units where they are used, the inefficient and costly practice of unit personnel making frequent trips to Central Supply and the numerous interruptions for the Central Supply workers to issue materials is eliminated or at least minimized. A dumbwaiter, properly located, is also helpful.

9. Where will supplies and equipment prepared in Central Supply be stored? Except in a very small hospital where the distance to Central Supply is minimal, it is usually better to stock a minimum quantity of items routinely used on the particular units and keep only a reserve of these items, (usually 24 hour stock) and materials infrequently used in Central Supply storage.

10. What sterilizing equipment is available in other areas of the hospital? The number, kind and location of sterilizers throughout the hospital may influence the Central Supply Unit functions.



Above: Diagram shows routing of supplies to and from the central supply.

11. Where will the Unit be located?
In an existing hospital available space usually dictates the location. In a new hospital ease of distribution to various hospital units is a very important factor. In a very small hospital an area adjoining the operating room suite is often selected.
12. The number of staff required to operate the unit would be determined by the services included, organization and training of personnel, and the utilization of mechanical equipment. It has been estimated that a 100 bed hospital, furnishing sterile material for treatments, surgical operations and deliveries, and some unsterile supplies, equipment, and apparatus will require approximately four workers provided mechanical equipment is used and work simplification practiced.
13. Are personnel facilities such as lockers and toilets nearby? Since all workers should change to clean uniforms to work in Central Supply, locker facilities should be available.
14. Are housekeeping facilities such as a janitor's closet nearby? Housekeeping facilities may be included outside the Central Supply Unit, but provision for a mop and some cleaning supplies within the unit is desirable.
15. What record, stock content and record system is planned? Some hospitals make a direct charge to patients for equipment obtained from Central Supply, others prepare charges from the patient's records on the basis of services given or have inclusive rates for care. Many hospitals have printed or mimeographed requisition forms which promote uniformity and simplify "paper work". An exchange system is also sometimes used: A procedure book and card file or Kardex for various procedures is also helpful. Requisitions may be received by messenger or a pneumatic tube system.
16. Teaching programs will require provision for instructional staff and training programs.
17. What work stations should be planned?
The work stations should provide a continuous work flow of all materials and equipment through the Central Supply Unit from dirty to clean to sterile, without back tracking for maximum efficiency and to avoid contaminating sterile supplies which could be disastrous.

Flow of Work

Materials are *received* into the Central Supply Unit by dumbwaiter, truck or messenger from

Central Stores
Hospital Units and
Laundry.

Materials from Central Stores are put in *Bulk Storage* area and removed as required. Used materials go to *disassembly* where they are taken apart and sorted for cleaning.

The first step in processing all used materials and some new materials brought into the unit is a thorough *cleaning*.

Clean materials, including linen from the laundry, go to the *processing* and *assembly* area where they are inspected, put in proper condition, assembled, and packaged for *sterilization* or *stored* clean ready for use. Sterilized goods are either distributed directly to the departments where they are used or *stored* in the storage area in Central Supply. Four storage areas are required, *sterile, unsterile, apparatus* and *bulk* (raw *storage*). Bulk or unsterile storage can be safely included in the processing area but it is advisable to provide a separate sterile storage area.

Materials are *distributed* by dumbwaiters, carts, trucks, or messenger to *hospital units*.

In order to operate the department *office space, employee* and *housekeeping* facilities must also be provided.

18. What equipment will be necessary to furnish the unit? How can equipment be arranged to expedite the work flow from dirty to clean to sterile without back tracking? Let us see how one hospital plan applied this principle. We have on the board (see page 27) the "walls from a floor plan for a Central Supply Unit for a 100 bed hospital". Each window represents four feet. There was no dumbwaiter on the plan so we would assume that material would be received and distributed by cart, truck, or messenger.

A separate area is provided for raw "*bulk storage* and *apparatus.*"

Used materials are received through this door, a dutch door is provided to exclude all except persons working in the area. A counter is provided for putting soiled materials.

For disassembly and cleaning, a *counter, three compartment sink* with *rubber tubing manifold,* and *distilled water* above for rinsing some articles is provided. Under the counter is a small household type *portable wash machine* to wash rubber gloves. In this machine 75 gloves are washed on both sides without turning in 12 minutes.

A *waste can* is also under the counter.

A *portable needle cleaner* which washes 100 needles in 12 minutes in contrast to 45 minutes by hand, is on the cleaning counter.

A *syringe washer* for washing glass syringes, test tubes, and other small glass articles, washes 200 syringes in 20 minutes. By hand, the process would require 16 hours (2 workers full time).

A *metal cart* with shelf is required for transport in the receiving and cleaning area.

For processing and assembly of materials we need a *work table* with storage compartments above and pull out bins, *counter space,* and *rubber glove drying, testing* and *powdering equipment.* A glove conditioner will dry 100 gloves in about 30 minutes with 5 minute personnel time, compared to two hours personnel time by hand. If this apparatus is not provided, racks for drying gloves are essential.

A 100 bed hospital at optimum occupancy uses daily approximately 75 pair rubber gloves, 200 syringes and 250 needles. The introduction of four labor saving devices will replace at least 1½ workers. Salaries saved will pay for the equipment in 8 months, and the workers freed could be utilized to increase the staff for patient care.

A *cart with shelf* is also required in this area.

The sterilizers include two *pressure sterilizers,* one for bulk sterilization and another for smaller items and rubber goods, and a *hot air sterilizer* for oils, petrolatum dressings, syringes and needles. *Sterile storage* area adjoins the sterilizing area, and *unsterile storage space* is also provided in a separate space.

A dutch door is also provided on the distribution door.

A *desk with chair, waste basket* and *telephone* is required for the supervisor to prepare requisitions and reports.

A *step ladder* is included for workers (who are usually women) to gain access to upper shelves.

Stools are provided because some tasks can be best performed with workers sitting.

A *lavatory* with a goose neck spout and necessary controls is required for "handwashing."

A *laundry hamper* is also provided.

We assume locker and toilet facilities are provided nearby.

There is no provision for solution manufacture since all solution preparation was included in the pharmacy plan. In a small hospital where no pharmacist is on the staff, parenteral solutions and sets are usually purchased. They may be stored and distributed from Central Supply. If solutions are prepared in the Central Unit a separate area should be provided.

If emergency drug supplies are kept in Central Supply a locked cupboard and refrigerator may be required.

Electrical outlets are provided and an electric plate may be required.

We have arranged the equipment to provide work flow from *dirty* to *clean* to *sterile* to produce maximum efficiency.

Let us see how we have provided for the materials that would be processed in the unit. Linen, Gauze, Cotton, Rubber gloves, Utensils, Syringes, Needles, Instruments, Glassware, Rubber tubing and Solutions: (1) Parenteral, (2) Irrigation, (3) Surgical fluids, and (4) Other. Miscellaneous non-sterile equipment: (1) Hot water bottles, (2) Ice caps, (3) Paper tissue, (4) Medicine, and (5) Other Apparatus

19. What inventory of supplies and equipment will be required to furnish the hospital with patient care supplies and equipment?

The usage of all patient care supplies and equipment should be studied. An existing hospital would analyze its needs and practices. The maximum number in use at one time of any piece of equipment such as oxygen tents, and at least a 24 hour supply of frequently used items such as syringes and surgical dressings is required. A 48 hour supply is recommended —one lot in use while the other is being processed and distributed.

Standardization and the CS Supervisor

by Betsey R. Carroll, R.N.
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● The part that the central service supervisor plays in helping her hospital establish a standardization program is not an easy one. As we all know, our central service departments are in their early stages of development in standardization procedure.

Here in Kansas City, it was felt that if central service supervisors could meet and exchange their knowledge, ideas, and experiences, they could better assist their hospitals in standardization programs. From this group have come many helpful suggestions on methods of handling equipment, better understanding of purchasing, and education of personnel, as well as methods for assisting the administration in establishing standardization.

Before beginning our job of standardization and organization of equipment and supplies, there are four questions which need to be answered by the central service supervisor and the hospital administration.

1. How interested are you, the central service supervisor, in the organization of your department?

At bulletin board, Mrs. Carroll makes daily check of list of equipment and location in hospital.

Mrs. Carroll looks over central supply list before placing an order.

2. How centrally controlled are the supplies used in your hospital?

3. Does the central service supervisor have the necessary authority to investigate and report needed changes?

4. How good are the working relationships between the various hospital units?

As has been stated by Margaret Schafer, nurse consultant, Division of Hospital Facilities, U. S. Public Health Service, standards should not be formulated by one person, but should represent the thoughts and ideas of a group. They should utilize the best in current knowledge and experience.

In some smaller hospitals where the staff is limited, it may be easier to personally contact all those concerned with the recommended changes. Larger hospitals present a greater problem in getting everyone together for discussion. It may be necessary for your administrator or director of nursing service to delegate to someone the authority to investigate and compile the necessary information.

This information should be submitted in written form to your hospital planning and procedure committee for further discussion. Then it should be sent to the administrator as a request for purchase of equipment or for a procedure change. A point to remember whenever a request for changes in equipment or supplies is sent to the administrator, is to see that your request conforms to commercial standards and federal specifications whenever possible.

I imagine some of you are asking, "Why should the central service supervisor be the person chosen to spearhead the obtaining of this information?" Well, why not? Who is better qualified? She should be the one person in the hospital who is in close contact with demands, needs, complaints and problems regarding supplies and equipment.

The question which now faces the central service supervisor is, "How will I collect this information?" One method is what I will call the "leg work method." In brief the leg work method involves contacting the following people:

1. Director of nursing service. Inform her of the proposed change and enlist her aid in informing the hospital staff members concerned.
2. Purchasing agent. More detailed information about the item under discussion can be obtained here. The purchasing agent can provide literature for teaching and can give information on the availability of the item, cost to the hospital, and the delivery schedule. The agent can assist in obtaining the item for trial use if necessary.
3. Supervisor, head nurse and doctors. Familiarize them with the recommended change. Ask for comments: inquire as to requirements and problems concerning the item. It may be beneficial to establish a research project to aid in determining these requirements.
4. Chairman of procedure committee. She will have the opportunity to call her committee together for preparation of a new procedure or revision of an old one, should this item be purchased.

The central service supervisor herself should then ascertain what problems her department will have concerning storage, cleaning, assembling, and sterilization. She should determine whether or not the change calls for a new procedure.

Still another responsibility is to assist in the planning of a teaching program for personnel in the various hospital units where the new or added equipment has been placed. If the recommended change is to become a standard, acceptance by all concerned is needed before it can be established.

One way this acceptance can be promoted is for the central service supervisor to make "daily rounds" on the hospital units. If this is impossible, she should schedule her time to permit this procedure once or twice a week. The use of daily rounds will assist in establishing better personnel relationships with other units by letting people know that she is interested in their problems, ideas, and suggestions regarding equipment which is being used or which may be needed.

Another standardization problem that confronts the central service supervisor is the establishment of quotas for stock supplies which are maintained on the units and exchanged at frequent intervals during the day or night. This can be done by consulting with the supervisor and head nurse of the unit as to the probable needs and the type of patient admitted.

Having determined an approximate standard, there should follow a period of close checking and recording to determine if this standard will meet needs. Revisions may be necessary. These can be made through another conference with the supervisor and the head nurse. After this trial period with the approximated standard, a permanent standard can be established.

Standardization in the Central Supply Department —An Outline Guide for Planning

by
Margaret K. Schafer

Standardization, a process, consists of comparing with and bringing to an accepted standard. There are three prerequisites necessary to develop a standardization program in a Central Supply Department. First, there must be a *Standard* which can be used as a guide or rule; second, there must be *law and authority* to promote plans and enforce rules; and third, there must be general *acceptance* of all concerned. The following outline delineates the steps to be taken by a central supply supervisor when developing a Standardization program.

I. Standardization of Supply and Equipment items including trays and sets.
   - A. Prepare a list of all items of supply and equipment, including trays and sets, furnished from the Central Supply Department.
   - B. Review the nursing or medical procedures followed when using the items.
     1. Check the use of each item.
     2. Consult committees and individuals concerned about any changes or additions indicated.
     3. Review reference materials and standards recommended by professional groups, accrediting agencies, governmental authorities or experts in the field.
     4. Whenever possible, eliminate, consolidate and simplify the items.
     5. When indicated, try out new items or proposed changes in one area as a test or research project.
   - C. Prepare a draft of the suggested revised list, which will be used as the "Standard."
   - D. Have the suggested list reviewed by all persons concerned, including physicians, nurses, purchasing agent, and the business office staff.
   - E. Obtain administrative acceptance from the hospital and medical authorities.
   - F. Prepare a procedure book, card file, or Kardex of central supply items, including trays and sets.

II. Standardization of Arrangement of Supplies and

Equipment in the Central Supply Department.

A. Prepare lists of supplies and equipment for the following:
   1. Raw supplies
   2. Supplies and equipment to be processed
   3. Supplies and equipment to be stored
   4. Supplies and equipment for administrative functions
   5. Supplies for housekeeping functions
   6. Supplies for personnel functions

B. Determine frequency of use

C. Determine amounts required for a given period, such as daily, weekly, monthly.

D. Determine emergency requirements.

E. Establish which items and the quantities of each item which will be kept in each area of the Central Supply Room, i.e., receiving, clean-up, processing-assembly, sterilizing, sterile storage, unsterile and apparatus storage.

F. Work out an orderly arrangement for the storage and work areas. Place the articles most frequently used in the most accessible location.

G. Make a chart for each storage and work area showing the items, their location and quantities. Post the charts in a conspicuous place. Put copies of the charts on Cards or a Kardex file card.

H. Make personnel assignments for the care of the storage areas, including cleaning, inventorying and stocking.

I. Keep the storage and work areas arranged according to the "Standards" indicated on the cards. Impress upon all members of the staff the advantages of "A place for everything and everything in its place."

III. Standardization of Procedures for Care and handling of supplies and equipment.

A. Prepare a list of supplies and equipment to be processed or handled in the Central Supply Room, including sterilization.

B. Review reference materials and standards recommended by professional authorities, accredited or licensing agencies and experts in the field.

C. Prepare a draft of procedure for each type of supply or equipment.

D. Consult with committees and individuals concerned about additions, corrections or changes indicated. Whenever possible, eliminate, consolidate, and simplify the procedures.

E. Prepare a final draft of procedures. Have the draft reviewed by as many people as possible or advisable, who will be affected or who are concerned with the procedures.

F. Prepare a procedure book, card file or Kardex of procedures.

G. Prepare a separate card with procedure for each area of the Central Supply Room, i.e., clean-up area, processing area, sterilizing, etc. Keep cards in that area for reference.

H. Orient all personnel to the new standards. When indicated demonstrate the procedure.

I. Keep procedure standards up-to-date. Review at stated intervals and revise when necessary.

A Guide to Central Supply Literature

Compiled by Margaret K. Schafer, R.N., Nurse Consultant
Division of Medical and Hospital Resources
Bureau of Medical Services, U. S. Public Health Service, Washington, D. C.

Annunciata, Sister M. "Economy is a Major Advantage of a Central Supply Service." *The Modern Hospital*, October 1946, Vol. 67: pp. 78-80.

This report of the central supply service at Mercy Hospital (Portland, Me.), a 150-bed hospital, was made after three years of operation. The service has demonstrated increased efficiency, economy, and education. The types and amount of various items of equipment and supplies are listed. A staff of seven operate the department.

Archambault, George F. "Hermetically Packaged Water and Surgical Fluids." *The Journal of the American Pharmaceutical Association*, June 1952, Vol. XIII: No. 6, pp. 415-420.

The reasons for and advantages of preparing surgical fluids in a hospital pharmacy are presented. The value of using flasked sterile solutions instead of water from conventional water-sterilizers is also pointed out with the estimated quantity of sterile water required for operating room and delivery room use.

Barrett, Jean, R.N. "The Central Supply Room." *Ward Management and Teaching*. New York: Appleton-Century-Crofts, Inc., 1949, pp. 133-136.

The advantages and disadvantages of operating a a central supply department and the determining factors in the amount and type of materials issued from a central supply department are included in this section of the textbook.

Bindel, Catherine A. "Central Supply is the Root of Good Service." *The Modern Hospital*, December 1948, Vol. 71: pp. 70-72.

A detailed description of functions performed in the central supply room at Wesley Memorial Hospital (Chicago) is given with work schedules and procedures. A photograph and description of a card index file for procedure and tray-setup cards and photographs of needle cleaning apparatus are included.

Bindel, Catherine A. "From Muslin to Metal." *The American Journal of Nursing*, November 1948, Vol. 48: pp. 699.

The use of the metal tube "steritube" for sterilizing assembled needles and syringes is described. Convenience and economy plus safety of the method are emphasized.

Bredenberg, Viola Constance. *A Functional Analysis of the Nursing Service Team.* Washington, D. C.: The Catholic University of America Press, 1949, p. 23.

The total number of mean trips to the central supply room from the one nursing unit studied was reduced from 101 to 54 by planning and reorganizing the assignment of functions on the nursing units.

Bredenberg, Viola C., R.N. *Nursing Service Research.* Philadelphia: J. B. Lippincott Co., 1951, pp. 156-158.

The organization chart for the central supply department at Providence Hospital (Washington, D. C.) with an outline of the job qualifications and specifications are included in the appendix of this book.

Brown, Madalene F., R.N. "Our Central Supply Room Truck." *The American Journal of Nursing*, December 1951, Vol. 51: p. 713.

This article gives a description, with photograph, of the special truck used at the New England Medical Center Hospital to deliver supplies and equipment from the central supply departments. This truck is stored in the patient-unit utility room and sent to the central supply daily for stocking.

Bryan, Helen M., R.N. "Ways and Means to Ease Labor Shortage." *Hospitals*, November 1952, Vol. 26: pp. 60-61.

The value of a central supply department in improving the economy of the hospital is given with several specific labor-saving pieces of equipment.

Celestine, Sister, R.N. "Evolution of a Practical Central Service." *Hospitals*, May 1950, Vol. 24: pp. 44-50.

Central service at Hotel Dieu, New Orleans, is described including the planning committee, construction, a floor plan with work flow diagrammed, and a description of the steps in processing materials throughout the department. The method of accounting for equipment and supplies is also described.

Donohue, F. M.; Statia, P. C. "Postnatal Perineal Care: A New Concept." *The Hospital Pharmacist*, March-April 1952, Vol. V: pp. 71-72.

The procedure used at Kitchener-Waterloo Hospital (Kitchener, Ontario) for providing sterile trays for perineal care, including Fenwal flasks of sterile solution, is described with a photograph.

Frey, Thomas E., R.N. "Central Supply Service." *The American Journal of Nursing*, February 1951, Vol. 51: pp. 119-122.

This is a very complete discussion of the central supply service at Alexian Brothers Hospital (Chicago). It includes planning, constructing, equipping, staffing, operating, managing, and the educational phases of the service. The educational values are stressed. A list of sets with their contents is included.

Friedman, Berly M. "A Hospital Laundry Meets Test by Paying Its Way." *Hospitals*, November 1951, Vol. 25: pp. 81-82.

A procedure for washing rubber gloves and surgical sponges in a hospital laundry is outlined in this article.

Graham, Reuben H. "The Purchasing Agent Can Help Ease the Labor Shortage." *Hospitals*, October 1952, Vol. 26: pp. 90-92.

A set of rules to govern the purchase of labor-saving equipment is outlined, and the value of purchasing mechanical equipment for cleaning rubber gloves, needles, and syringes is given.

Graves, Clifford, L., M.D.; Longley. Ella K.; Erikson, Eva H.; De Busk, Roger W., M.D. "Where, Oh Where Has Our Dressing Cart Gone?" *The Modern Hospital*, May 1953, Vol. 80: pp. 60-61.

Two physicians and two hospital administrators express their opinions on the value and faults of a central supply system. Dr. De Busk and Miss Erickson recommend that a central supply department process and sterilize supplies and equipment, but not necessarily be the only storage area.

Harris, Paul. "Strictly Central Service." *The Modern Hospital*, July 1950, Vol. 75: pp. 80-82.

A floor plan with a description of a central supply department to serve the Operating Room Suite, Delivery Suite, and Patient Units is shown. Separate clean-up areas for operating room and delivery suites assure preliminary cleaning before any equipment is taken into the clean central supply area.

Hassan, William E. "Management of the Central Supply." *Hospital Topics*, May 1953, Vol. 31: p. 72.

This article emphasizes the pharmacist's role in operating a central supply department. The importance of having solution preparation and supervision under the pharmacist is stressed.

Hurley, John L. "Standardized Technics Insure Better Patient Care." *Hospital Topics*, December 1952, Vol. 30: pp. 77-79.

The central supply room department at St. Francis Hospital (Grand Island, Neb.) is described with the advantages it has proved. Included is an excellent floor plan showing the continuous flow of materials.

John, Sister M. "The Departments of Pharmacy and Central Supply, Mercy Hospital, Toledo, O." *The Bulletin of American Society of Hospital Pharmacists*, January-February 1946, Vol. 3: pp. 14-16.

The departments of pharmacy and central supply are combined at Mercy Hospital (Toledo, O.) under the supervision of the hospital pharmacist. The descriptions of the various areas of the departments, services furnished and staffing is described.

Krell, W. L. "Supplies Flow Smoothly with a Central Service." *The Modern Hospital*, August 1945, Vol. 65: pp. 57-59.

A description of the procedures used in the central supply department at Mills Hospital (San Mateo, Calif.) is given with details on the care and processing of individual items. A procedure for inventory control, charges and requisitioning is also included. Some of the procedures are now outdated, but the article can still serve as a guide.

Lawrence, Carl A. "A Survey and Evaluation of Germicides." *The Bulletin of American Society of Hospital Pharmacists*, November-December 1950, Vol. 7: pp. 308-313.

A brief survey of antiseptic and disinfectant agents is discussed with indications of conditions under which they should be used.

Lehmann, Emmy E., R.N.; Bishop, Francis W. "Introducing a Better Way to Process Surgical Gloves." *The Modern Hospital*, October 1948, Vol. 71: pp. 78-80.

—"We Streamlined Our Glove Technic." *The American Journal of Nursing*, February 1952, Vol. 52: pp. 176-177.

The method used to wash, powder and test rubber gloves at Strong Memorial Hospital (Rochester, N. Y.) is discussed. Special equipment modified or constructed for these functions is described with photographs of each item. The American Journal of Nursing *article by the same authors gives the more recent improvements and details with newer equipment for glove preparation and sterilization.*

Letourneau, Charles U., M.D.; Fleigh, George. "Approved Hospital Technics to Control Viral Hepatitis." *Hospitals*, February 1952, Vol. 26: pp. 97-104.

The hospitals' legal and moral obligation to protect their patients and employees from preventable harm such as viral hepatitis is discussed. The disease is described and sources of infection outlined. Methods of prevention are given, including the recommended safe method of sterilization of syringes and needles.

Linderoth, Karl. "Work Simplification Applied to the Hospital." *Hospital Topics*, June 1953, Vol. 31: pp. 81-85.

The principles of work simplification and the procedure for method analysis are explained.

Markus, Fred E. "Work Simplification." *Hospital Topics*, March 1953, pp. 61-64.

Principles of work simplification are delineated and the procedure for applying these principles in a hospital outlined.

Maze, Coleman, L., A.M., MCS., Ph.D. *Office Management.* New York: Ronald Press Company, 1947.

Chapters on office organization, principles, personnel requirements, including the advantages and disadvantages of centralization, physical facilities and operation, contain guiding information which can be applied to hospital departments and services. Work simplification and standards are also included.

McCulloch, Ernest C., M.A., D.V.M., Ph.D. *Disinfection and Sterilization*, Second Edition Revised. Philadelphia: Lea and Febiger, 1945.

A text book covering the subject of sterilization and disinfection. The section on surgical sterilization by heat contains material published by the American Sterilizer Co.

Meleney, Frank Lamont, M.D. *Treatise on Surgical Infections.* London: Oxford University Press, 1948.

This book shows the necessity of preventing bacteria from gaining a foothold in the human body, and shows the methods of killing or eliminating them when they do enter the body and establish themselves. It covers the bacteriological problems on surgery, the course of surgical infection and therapeutic aids, and methods of maintaining high standards of sterile technic. The sections on sources and control of operative wound infections, including sterilization of supplies and equipment, contain valuable, factual, practical information for many, including physicians, laboratory workers, nurses, and hospital administrators. Among the results of many studies on infections described, is a report that the hospital stay of patients whose clean wounds become infected is twice as long as patients whose wounds remain clean.

Moore, William F. "Automatic Washer-Dryer Units Simplify Glove Room Duties." *Hospitals*, October 1952, Vol. 26: pp. 117-118.

Brooklyn Hospital, N. Y., a 410-bed hospital, is saving more than $200 per month since they began using a twin automatic-type clothes washer and dryer for rubber gloves. Their procedure for processing the gloves and estimated monetary savings is described.

Morse, Mary E., M.D.; Frobisher, Martin, Jr., B.S., Sc.D.; Sommermeyer, Lucile, R.N., B.S., M.Ed. "Inhibition, Destruction and Removal of Microorganisms." *Microbiology for Nurses*, Philadelphia: W. B. Saunders Company, 8th Edition, 1946, pp. 126-187.

This section of the text book includes information on the principles and methods of inhibition and destruction of microorganisms. The photographs are taken from publications of the American Sterilizer Co.

Moyer, Carl, M.D. "Dangers of Using Chemicals in Splash Basins." *Hospital Topics*, January 1950, Vol. XXVIII, p. 43.

The author states that no solution other than normal saline should come in contact with tissue undergoing surgical trauma.

Nocka, Paul F.; Walter, Carl W., M.D. "New Central Supply Room at Peter Bent Brigham." *Hospital Management*, September 1950, Vol. 76: pp. 36-40.

Reorganization and revamping of the central supply department at Peter Bent Brigham Hospital in Boston, Mass., is described. A floor plan, work flow chart, personnel time, and assignment chart are included.

Norton, Phyllis A., R.N. "Planning a Central Supply Department." *The American Journal of Nursing*, October 1952, Vol. 52: pp. 1215-1216.

Description of the planning done for the new central supply department at the Hospital for Sick Children (Toronto, Ontario) and operational procedures are outlined in this article. The service furnished and facilities, area in square feet, and equipment used, are also delineated. Criteria for determining space requirements are given. The problem of staffing has not been difficult. A definite orientation program for personnel has stimulated their interest and enthusiasm.

Perkins, John J., M.S. "Dry Heat Sterilization." *The Manual*, Vol. 11, No. 1, August 1951.

—— "Precision Sterilization with 'Cyclomatic' Control," *The Manual*, Vol. 10, No. 2, May 1950. The American Sterilizer Co., Erie, Pa.

These two pamphlets give basic information on steam and dry heat sterilization with an explanation of the preparation and sterilization of supplies and equipment. A chart giving the recommended methods and time for sterilizing various materials is included in the August 1951 issue.

Prickett, Edna A. "Work Simplification in Central Supply Service." *Hospital Topics*, July 1952, Vol. XXXI, pp. 75-80.

How the principles and technics of work simplification as outlined by Karl Linderoth in the June 1953 issue of Hospital Topics *can be applied to a central supply service is discussed. The steps used in preparing a Flow Process Chart for processing rubber gloves is explained.*

Rein, H. "A Central Supply Service." *The American Journal of Nursing*, August 1947, Vol. 47: pp. 540-543.

Central supply service at Aultman Hospital (Canton, O.) is described. Included is staffing and a detailed description of the various items with daily amounts and methods of processing each article. Distribution schedules are also given.

Rosenberger, Donald M. "Central Sterile Supply Has Come to Stay at Hamot Hospital." *Hospitals*, May 1944, Vol. 18: pp. 53-55.

Advantages of a central supply service are delineated. A floor plan of the Hamot Hospital (Erie, Pa.) central supply unit is included; also the staff required to operate the department is described. The importance of having a full-time supervisor is emphasized.

Schafer, Margaret K. "Central Supply = Economy and Efficiency." *Hospital Topics*, April 1952, Vol. 30: pp. 27-30.

Advantages and difficulties of operating a centralized service are delineated, followed by an outline of basic information required to plan a central supply department. Work flow is outlined and a floor plan is shown.

Schemmel, De Lores, J., R.N. "One Nurse Can't Do Everything." *The Modern Hospital*, April 1953, Vol. 80: pp. 60-61.

Job description for ward aide, Central Supply Department, at Huntington Memorial Hospital (Pasadena, Calif.) is included in this article on nursing service organization and planning.

Smith, J. E. "A Pharmacy Service Benefits Smaller Hospitals." *The Canadian Hospital*, September 1951, Vol. 28: pp. 37, 80-108.

Value of combining central supply services and pharmacy service in small hospitals under the supervision of the pharmacist is discussed.

Smith, Perrin. "Kitchener-Waterloo Hospital." *The Bulletin of American Society of Hospital Pharmacists*, January-February 1953, Vol. 10: pp. 30-34.

The service of the combined pharmacy-central supply department is described.

Snoke, Albert W., M.D. "You Ought to Autoclave." *The Modern Hospital*, August 1942, Vol. 59: pp. 63-65.

Value of using an autoclave instead of the boiling type sterilizer in hospital utility rooms to improve hospital efficiency and economy is explained.

Stanton, Robert, A.I.A. "The Person Responsible—Central Supply—Custom Built." *Hospitals*, November 1948, Vol. 22: pp. 48-50.

Xavier, Sister M. Francis. "Central Supply — Custom Built; a Plan and a Place for Everything." *Hospitals*, November 1948, Vol. 22: pp. 45-47.

Detailed description of central supply department at St. Mary's Hospital (San Francisco, Calif.) is discussed by the central supply supervisor and architect. Architectural drawing is included. The architect also describes how efficient management and organization plus careful planning and construction have resulted in very efficient service.

Statia, Perrin, Phm. B. "Let the Pharmacist Do It." *American Professional Pharmacist*, May 1951, Vol. 17: pp. 448-454.

Central supply department at Kitchener-Waterloo Hospital is described with the advantages of pharmacist supervision. The pharmacist's special qualifications for the position are discussed.

Sutton, Frank C., M.D. "Intravenous Service Centralized to Everybody's Satisfaction." *The Modern Hospital*, September 1945, Vol. 65: pp. 76-77.

Rochester (N. Y.) General Hospital's intravenous fluid administration service operating out of the central supply department is described.

Thrasher, Jewell, R.N. "Is Central Supply Room for 75-Bed Hospital Profitable?" *The Modern Hospital*, June 1946, Vol. 66: p. 39.

Value of central supply services in a small hospital is emphasized in this article.

Underwood, Weeden B. *Textbook of Sterilization.* Chicago: The Lakeside Press, R. R. Donnelley & Sons, 1942, p. 121.

The basic principles of sterilization with the practical aspects of sterilization are included in this text book—one of the first publications in the field.

Ustas, Mathew J. "Control is the Answer to Economy in the Central Supply Room." *Hospitals*, June 1952, Vol. 26: Part 1, pp. 67-69.

The method used for requisitioning and accounting for items of supply and equipment at Lynn Hospital (Lynn, Mass.) is described with samples of the various forms used.

Ustas, Mathew J. "Annual Workload of a Central Supply." *Hospital Topics*, May 1953, Vol. 31: p. 71.

This list of items furnished from the central supply department at Lynn Hospital (Mass.) during 1951 and 1952 should be a useful guide to hospitals planning central supply departments and can be used as a checklist for hospitals now operating this service department.

Veronica, Sister Mary, R.N. "Central Supply Pays—in Any Size Hospital." *Hospital Progress*, June 1949, Vol. 30: pp. 184-185.

St. Joseph's Hospital has furnished central supply service since 1936. The values of the service are outlined and the supplies and equipment required for the 130-bed hospital to furnish the service are listed.

Waller, M. V.; Holloway, N. "Central Supply Goes Visiting; Public Health Nurses Carry This Service from Denver General into the Community." *The Modern Hospital*, February 1951, Vol. 76: pp. 57-58.

Denver General Hospital central supply department supplies the City VNA with sterile supplies and equipment such as needles, syringes, dressing and treatment trays and sterile dressings.

Walter, Carl W., A.B., M.D. *The Aseptic Treatment of Wounds.* New York: The Macmillan Company, 1948.

This book was written primarily to serve as a textbook for medical school courses in surgical technic, but is a valuable text for all hospitals and technical personnel. The subject of prevention of wound infections is discussed and the details of operating room suite and central supply department procedures are described and illustrated with drawings.

Wright, Marion J., R.N. "Messenger Service at Harper Hospital." *The American Journal of Nursing,* February 1952, Vol. 52: pp. 172-173.

The central messenger service to include pick-up and delivery service of central supply items has increased the amount of time nursing personnel have for patient-care activities at Harper Hospital, Detroit.

"Bibliography on Sterile Supply Supplemented with Articles." *Hospitals,* April 1953, Vol. 27: pp. 87-88.

This article includes a recommended reading list of nine annotated articles for persons planning central supply departments.

Division of Hospital Facilities, U.S. Public Health Service, Dept. of Health, Education, and Welfare. *Hospital Equipment and Supply Lists.* 1952 edition.

A guide list to assist planning groups in preparing equipment and supply lists for 50-100-200 bed hospitals. A recommended procedure for preparing equipment lists is also given.

Division of Medical and Hospital Resources, Public Health Service, Dept. of Health, Education, and Welfare. "Elements of Hospital Operation." Reprinted from *Hospitals,* July 1950, Vol. 24: Central Supply Room, p. 28.

A check list of questions pertaining to a hospital central supply department is included in this publication, intended primarily as a guide in establishing a new hospital.

"The Economical Use of Surgical Dressings"—Script accompanying the strip film of the same name. Johnson and Johnson Hospital Division, New Brunswick, N. J.

How hospitals can save money by purchasing standardized and ready-made items of surgical dressings is described.

"Hospital Central Supply Washes Needles and Gloves on Production Basis." *University Record,* University of Michigan, April 1953, Vol. VIII: pp. 1-4.

The central supply department of the University Hospital, Ann Arbor, Mich., is described, giving procedures and staffing used for cleaning and processing needles, syringes, rubber gloves, and linen and surgical dressings.

"Hospital-Made Needle Cleaner." *The Hospital Pharmacist,* September-October 1952, Vol. 5: p. 298.

This article describes the hospital-made needle cleaner at Kitchener-Waterloo Hospital, which costs $35 and uses the pressure from a Gomco Pressure Suction machine.

"Large Scale Syringe Washer Now Available." *Hospital Topics,* March 1953, Vol. 31: p. 64.

A mechanical syringe washer which washes 200 syringes in 20 minutes and requires the time of 1/4 person for operation is described.

"The Story of New York Hospital-Cornell Medical Center." *Hospital Management,* July 1952, Vol. 74: "Central Sterile Supply," p. 50.

The central supply service of New York Hospital is described in this article, including the daily amounts of the various items delivered to the 70 stations. The staff employed to furnish this service is also given.

U. S. Department of Labor and U. S. Employment Service: *Job Descriptions and Organizational Analysis for Hospitals and Related Services*—"Central Supply Section," pp. 138-140. Washington, D.C.; U. S. Government Printing Office, 1952.

Organizational pattern for a central supply department with job descriptions for the various positions is included in this section of the text.

"The Pharmacist and the Central Sterile Supply." *The Hospital Pharmacist,* March-April 1953, Vol. VI: p. 105.

This short article gives a complete list of sterile tray set-ups prepared in the central supply department at the Kitchener-Waterloo Hospital.

Supplement No. 1

1. "Severe Dermatitis is Eliminated by Complete Removal of Residual Drugs from Syringes." HOSPITAL TOPICS, February 1954, Vol. 32, pp. 81-82.
   The importance of adopting adequate methods for cleaning and sterilizing syringes in hospital and immunization clinics is emphasized. The method described is the one used at Peter Bent Brigham Hospital in Boston where a mechanical syringe washer and the dry heat method of sterilization is used.

2. *Transcript Institute on Operating Room Administration,* American Hospital Association, Chicago, Illinois, May 1952. $3.00.

   This transcript of the first institute on operating room administration contains excellent articles which any central supply department supervisor should find helpful.
   Cordes, Donald W., "Principles of Administration," pp. 30-41.
   Jones, Robert S. "Work Simplification," pp 57-70.
   Perkins, John J., "Principles and Methods of Sterilization," pp. 71-98.
   Taffley, Edna, "Orientation and In Service Program for Operating Room Personnel, pp. 99-104. Murdough, Thomas G., "Purchasing Hints for Operating Room Supervisors," pp. 155-159.

3. Beck, Carl E., Shay, D. E., and Purdum, Arthur W., "An Evaluation of Paper used for Wrapping," *The Bulletin of the Hospital Pharmacist,* Sept. Oct. 1953, pp. 421-427.

This article is a report of a study made to evaluate papers for use as an economical substitute for cloth wrapping material for articles to be sterilized in an autoclave. Fifty-five samples of paper were tested. Of the group of acceptable papers, the Kraft type papers were the most suitable and most economical.

4. Comer, E. Wayne, "Pre-Packaging," *Hospital Topics*, September 1953, Vol. 31, pp. 71-72.
The results of an investigation and study in 50 hospitals to ascertain the possibilities of industry prepackaging and sterilizing dressings and other gauze cotton supplies showed much variance between hospitals in the wrapping and dispensing of dressings and the sterile technic procedures. It was suggested that the real problem of sterile dressings should be defined by a research board representing all interested parties in the "patient care" situation, such as AHA, ACS, AMA, and ANA. Then after thorough study in micro-biology and extensive cultures in representative hospitals, minimum standards for packaging and wrapping materials, sterilizing and dispensing could be developed. From this foundation industry could serve hospitals by prepackaging. Accurate cost accounting and a philosophy that menial labor in a hospital is not cheap must precede real success in standardization and pre-packaging of dressings.
5. Lenard, Alexander, M.D., "Poliomyelitis — The Possibility of Syringe Transmission," *Medical Times*, Vol. 79, July 1951, pp. 395-399.
The use of individual sterile syringes and needles in all cases of vaccination and immunization is recommended. An explanation of how a syringe filled with fluid is contaminated when a contaminated needle is removed is given.
6. Roberts, E., "Five Big Features of Central Service," *Hospital Management*, December 1953, Vol. 76, pp. 64-66.
This article is a short, clear, concise description of the Central Supply Service at the new North Shore Hospital, Long Island, New York. The application of simplification, standardization and safe procedures is described. The beginning staff for establishing the service is given.
7. Anderson, Mary Helen, "Setting Up a C.S.R. Procedure Manual," *Hospital Management*, January 1954, Vol. 1, pp. 60-83, February 1954, Vol. 2, p. 65.
These two articles describe a method for setting up a Central Supply Room procedure manual including a cross-reference system.
8. Centralized Material Section (Central Supply Service). TM8-275, Department of the Army Technical Manual, Department of the Army, Feb. 1952. Available from the Superintendent of Documents, U. S. Government Printing Office, 75 cents.
This guide is the result of a thorough study of central supply requirements. It includes floor plans and cabinet details for hospitals of different types of construction and sizes (100-1500 beds). It also includes equipment, operating procedures and staffing requirements. Since this pamphlet was published there have been some changes in procedures and equipment recommendations for Central Supply services, such as mechanical washers for gloves, needles, and syringes. However, the guide contains the best basic data available on area delineation and space requirements.
9. Hogen, T. Joseph, "Hospital Water Stills." *The Bulletin American Society of Hospital Pharmacists*, Sept.-Oct. 1953, pp. 430-433.
Basic information on distilled water with the location and care of equipment is given in this article.
10. *Practical Planning of the Central Sterile Supply Department*, American Sterilizer Company, Erie, Pa., 1950.
The area requirements with square foot allotments for different services of a Central Supply Service are included in the guide. Floor plans with photographs of Central Supply Departments in hospitals of various sizes and types are included.
11. Donahue, Florence; and Roberts, Evelyn, *Sterile Tray Index for Hospitals*, Wilmot Castle Company, Rochester 7, New York, 1953.
This pamphlet consists of over 100 treatment and diagnostic tray set-ups with photographs.

Supplement No. II

Anderson, Mary Helen. "Setting Up a CSR Procedure Manual." *Hospital Management*, January 1954, Vol. 77: pp. 60+; February 1954, Vol. 77: p. 65; March 1954, Vol. 77: pp. 74-76; April 1954, Vol. 77: pp. 76-82; May 1954, Vol. 77: pp. 80-82+; June 1954, Vol. 77: p. 66; July 1954, Vol. 78: p. 66.

The articles in this series describe a method for setting up a CSR procedure manual which will be valuable as a workable guide to CS personnel. Samples of forms included.

Anderson, Mary Helen. "Central Service—A Challenge." *Nursing Outlook*, December 1955, Vol. 3: pp. 655-656.

The growth of central supply to a service center for the entire hospital is told in this article, which points out that the full potentiality of this department has only recently been recognized by nursing service administrators.

Anderson, Mary Helen. "Defining the Clerk's Role in Central Service." *Hospital Management*, March 1955, Vol. 79: pp. 78-79.

The tasks that are listed may be effectively handled by a clerk to aid the supervisor. These include answering the telephone and following up on missing items.

Anderson, Mary Helen. "Five Steps to Guide You in Evaluating New Products." *Hospital Management*, January 1955, Vol. 79: pp. 74 and 85.

The author gives five specific steps to guide the supervisor of central supply in evaluating new products. A filing card system is suggested to simplify the tabulations of results and interpret the findings.

Anderson, Mary Helen. "How Safe Is Your CS Department?" *Hospital Management*, June 1955, Vol. 79: pp. 74-75.

A check list of suggested safety habits for a central supply department to keep on file is given in this article. The list includes safety measures for the patient,

visitors, and personnel in central supply and other departments.

Anderson, Mary Helen. "Safety, Efficiency, and Economy." *Hospital Management*, December 1955, Vol. 80: pp. 78-80.

The author suggests how equipment that has outlived its usefulness may be utilized for something besides the purpose for which it was designed. An example: Plastic tubing fastened to adhesive to aid in holding dressings in place.

Anderson, Mary Helen. "Setting Up a Pick-Up and Delivery Service." *Hospital Management*, April 1955, Vol. 79: p. 49.

The need for this type of service and the procedure for establishing it are given in this article. A suggested schedule is included.

Anderson, Mary Helen. "Solving Those Disagreeable Problems." *Hospital Management*, October 1954, Vol. 78: pp. 75-76+.

An article describing the expansion of central service and the establishment of standards to meet the additional functions.

Anderson, Mary Helen. "The Administrative Structure of CS." *Hospital Management*, February 1956, Vol. 81, pp. 90 and 105.

Various methods used for central service administration are discussed in this article, including supervision by nursing service, by the operating room, or by a department head who is not a nurse, such as a pharmacist, or by someone directly responsible to the hospital administrator.

Anderson, Mary Helen. "The Case for the Dressing Tray." *Hospital Management*, August 1955, Vol. 80: pp. 70-71.

The author questions the efficiency of the dressing cart, since many items are used infrequently, and contamination results from many exposures. The advantages of dressing trays dispensed by central service with the correct and needed items for each dressing are presented.

Anderson, Mary Helen. "Training CS Personnel to Handle Oxygen." *Hospital Management*, December 1954, Vol. 78: pp. 75-76+.

The author describes the various methods for instructing central service personnel in the handling of oxygen, such as the use of manuals, films, and actual demonstration of the use of equipment.

Anderson, Mary Helen. "What Makes a Good Supervisor." *Hospital Management*, July 1955, Vol. 80: pp. 75-76.

Ambition, loyalty, and a sense of humor are the essential qualities of a good supervisor, the author states.

Abbott, Esther, R. N. "Let's Examine Ourselves As Central Supply Supervisors." *Hospital Management*, February 1955, Vol. 79: pp. 60-61.

The supervisor's duties and her need for good interdepartmental relations and familiarity with hospital policies are described in this article. A self-evaluation sheet is included.

Burack, David. "Paper Packaging Reduced Our Needle Breakage." *Hospital Management*, April 1955, Vol. 79: p. 48.

Glassine paper container reduced needle breakage. Method of processing is described in this article.

Brackett, Mary E., R.N. "The Central Service Needs Advice from Other Departments." *Hospital Management*, December 1954, Vol. 78: pp. 71-72. (Abstracted in HOSPITAL TOPICS, May 1954, Vol. 32: p. 78, in report from central supply session at the New England Hospital Assembly.)

The advantages of having central supply as a part of nursing service are discussed in this article.

The author points out the need for unusual requests and the need for an advisory group for the department supervisor. The value of central service as a fertile field for work simplification and the reasons why student nurses need orientation in this department are also discussed.

Bergmann, Werner, M.D. "Protection for the Points of Hypodermic Needles." *California Medicine*, April 1955, Vol. 82: p. 325.

The points of needles are often blunted in sterilization because of the contact with the walls of the metal sterilization tray. The author describes a protective holder which he says eliminates this hazard. The holder has slots and notches to hold the needles and may be boiled or autoclaved.

Bertilla, Sister Mary, R.N. "St. Mary's Central Sterile Supply Department." HOSPITAL TOPICS, July 1955, Vol. 33: pp. 85-86.

An account of a central supply unit that coordinates and centralizes the preparation of all sterile and nonsterile material used in the care of patients is given in this article. The value of the dishwasher and other types of equipment and the procedure for ordering and supplying of items are also discussed.

Carroll, Betsey, R.N. "Standardization and the CS Supervisor." HOSPITAL TOPICS, July 1954, pp. 77-78.

The CS supervisor, because of of her close contact with the demands, needs, complaints, etc., regarding supplies and equipment, is the logical person to spearhead the standardization program, the author says. She specifies the aid necessary in establishing standardization and where and how to obtain it.

Chandler, Velma L., Ph.D. "Sterilization of Supplies, Part I: Sterilization by Chemicals." HOSPITAL TOPICS, September 1955, Vol. 33: pp. 85-86+.

An informative article with graphic charts describing sterilizing agents, relative resistance of microbes, resting spores, suggested choice of disinfectants for TB technics, survival time of cells exposed to heat, factors affecting efficiency of chemical agents, neutralization of chemical agents by proteins, and the protection of organisms in hinges and crevices by proteinaceous materials.

Chandler, Velma L., Ph.D., Engler, P.L., Horvat, Helen, R.N., and Masci, J.N. "Sterilization of Supplies, Part II: Problem-Solving Clinic." HOSPITAL TOPICS, October 1955, Vol. 33: pp. 97-104.

Symposium of questions and answers on common problems regarding both chemical and steam sterilization.

Cooke, James W. "Equipment Room Has a Place for Everything." *The Modern Hospital*, July 1956, Vol. 87: No. 1, pp. 79-82.

A central equipment room — a subdivision of central supply — combines the advantages of centralized and decentralized storage at Akron City Hospital. Great accessibility and convenience to the nursing personnel has been achieved.

Downing, Alma. "Central Supply Service." *Canadian Nurse*, October 1954, Vol. 50: p. 811.

The author tells how the scope of the central supply has expanded from only sterilization to distribution and sterilization of special and emergency trays. To increase the value of the central supply department in her hospital, an experiment was carried out in which all dressings were changed by central

supply nurses. The importance of this procedure to student teaching and the responsibilities of the central supply supervisor are stressed.

Ferguson, Stanley A. "Color Adds Efficiency." *Modern Hospital*, September 1955, Vol. 85: pp. 65-66.

That color reduces fatigue and stimulates workers is the theme of this article. Other innovations and appliances which have increased the efficiency in the central supply department at the University Hospitals of Cleveland are also included.

Harper, Frank. "Up-To-Date Central Supply Equipment Cuts Hospital's Labor Costs." HOSPITAL TOPICS, August 1955, Vol. 33: p. 77.

Up-to-date equipment reduced by half the usual number of employees in the central supply department. Sending messages, charges, and small articles by pneumatic tube and using heavy-duty dumb waiters have added to greater efficiency.

Heard, Jack S. "Combined Central Supply and Pharmacy Service at the University of California." *The Bulletin American Society of Hospital Pharmacists*, November-December 1955, Vol. 12: pp. 607-611.

The central supply department at the University of California Hospital, Los Angeles, is under the pharmacy department. The essential factor in the successful operation of this department is the central service committee, which includes a representative of each section of the nursing service.

Hildebrandt, John, and Morrow, John L. "Analyzing the Cost of Central Supply." *Hospitals*, November 1955, Vol. 29: pp. 65-67.

The method presented in this article, by a comptroller and an assistant administrator, takes into consideration the fact that demands on central supply vary in accordance with the clinical service concerned. The authors say the cost apportioned to each unit should be based upon that unit's actual use of the central supply.

Hutto, Mabel, R.N. "Cabarrus Memorial Adopts Syringe and Needle Packaging." *Southern Hospitals*, April 1956, Vol. 24: p. 58.

The author states in this article her reasons for favoring syringe and needle packaging using the Steriphane technic.

J. Sister Annunciata. "The Economics of Central Supply." *Modern Hospital*, September 1955, Vol. 85: pp. 64-66. (Abstracted in HOSPITAL TOPICS, May 1954, Vol. 32: P. 79, in report on central supply session at the New England Hospital Assembly.)

Organization, maintenance, and the savings that may be realized through good planning, standardization, and the use of mechanical aids are well covered in this article.

Janke, Otto M. and Briggs, Frank R. "Reorganizing." *Hospitals*, November 1955, Vol. 29: pp. 68-73.

A report on reorganizing the central supply department and remodeling its facilities to fit this change. The goal was reached by the committee approach, attention to work flow, job simplification, and standardization.

Jordan, S.E., Ph.D., and Pfeiffer, C.C., M.D. "Parenteral Fluid Therapy — Basic Principles." *Modern Hospital*, November 1954, Vol. 83: pp. 102+.

The rational use of parenteral fluids requires an appreciation of the distribution of body water and electrolytes. Further information as to distribution of body water, concentration of ions in body fluids, approximation of body needs during water imbalance, physiologic defense mechanisms in acid-base disturbances, and parenteral fluids for clinical use are included in this article. Accompanying figures and tables are good visual aids.

Lang, Philip J., and Redfearn, Samuel E. "Everybody Talks About Prepackaging." *Modern Hospital*, August 1954, Vol. 83: pp. 80-82.

This article, including charts, shows the results obtained by standardization through prepackaging at the Touro Infirmary. The authors observe that few hospitals agree on standardization.

Manning, R.D. and Wilson, Pauline, R.N. "We Made Our Own Glove Powdering Device." HOSPITAL TOPICS, April 1955, Vol. 33: p. 77.

A picture and drawing show how to improvise a powdering device when finances will not permit purchase of similar equipment.

Larson, Carol, R.N. "How Central Supply Functions at Denver General." HOSPITAL TOPICS, August 1954, Vol. 32: pp. 79-82.

Central supply at Denver General services not only its own hospital units but areas outside: Visiting Nurse Association, TB control clinic, fire and police department, and other municipal departments. The author describes the procedure for supplying these areas and discusses the value of the procedure manual, Kardex file with pictures for tray set-up, and the use of requisition forms and stock inventory cards for control of supplies. Staff coverage and working schedule for an average day are outlined.

Markus, Frederick. "Function, Not Beauty Important in CSR Design." HOSPITAL TOPICS, August 1955, pp. 78-79.

Functional design in this department expedites the work flow of production. The need for proper inter-relation of the work stations and the proper planning that results in the utmost efficiency is stated by the author.

Markus, Frederick, and Christie, Mrs. Jean, R.N. "What is Wrong with Conventional CS Planning?" HOSPITAL TOPICS, December 1955, Vol. 33: p. 87.

The shortcomings in the planning of a central supply are given in this article—such as the lack of floor space where needed and permanent placement of equipment in the wrong order, which are very frustrating to the CS supervisor. The planner of a CS should have the general knowledge of production methods, timing, and flow and the air of the specialist and the "man on the bench" to plan advantageously.

Markus, Frederick, and Christie, Jean, R.N. "Basic CS Planning." HOSPITAL TOPICS, January 1956, Vol. 34: 93-95. "Storage in CS." February 1956, pp. 81-92. "Linen in CS." March 1956, pp. 119-121. "Syringe Processing." April 1956, pp. 107+. "Needle Processing." May 1956, pp. 111-115. "Glove Processing." June 1956, pp. 99-102. "Model CSR Floor Plans." July 1956, pp. 111+.

In this series of articles the concept of substantially reducing the labor element by using production line methods in CS is detailed by an architect and a nurse. Each article contains architectural drawings, showing layout of original method and the new layout with improved methods of planning, processing, and storage of supplies, to obtain the maximum efficiency in this department.

McNutt, John. Streamlining Central

Supply." *Hospital Management*, August 1954, Vol. 78: pp. 66-68.

Taking a good look at the present set-up of central supply and then deciding how it could best be rearranged to better advantage are suggested by the author, chief engineer, Grace Hospital, Detroit.

Noles, Eva, R.N. "How Central Service Grows." *Hospital Management*, June 1956, Vol. 81: pp. 76-78; July 1956, Vol. 82: pp. 80-81.

The author tells in these two articles of the growth of the Roswell Park Memorial Institute central supply department from a small 10'x10' room in 1952 to five large rooms (total area 16'x244'). Before and after drawings of the physical layout are included. The second article deals with the work flow, rotation of duties, processing of syringes, dressing trays, etc.

Morgan, Dorothy M., R.N. "Dressings Research Project, University of Chicago Clinics." HOSPITALS, October 1954, Vol. 28: pp. 88.

The results of a four-month study of surgical dressings are given by the author. The economies achieved through standardization are described.

Ouderkirk, Elizabeth, R.N. "In-Service Program Aids CSS Efficiency." HOSPITAL TOPICS, October 1954, Vol. 32: pp. 97-99.

Efficiency, the author believes, is greatly aided by early morning discussions and classes. The use of volunteer help, written instructions, and posting of the operating schedule all help to make the CS department run more smoothly.

Palmer, David H. "Selection Is the Key to Economy." *Modern Hospital*, May 1955, Vol. 84: No. 5, pp. 63-65.

It is important for the supervisor to be familiar with the product and pass her experience on to the purchasing agent or department, the author emphasizes.

Phillips, Elizabeth C., Gunter, Muriel E., and Gray, Katherine C. "We Have Gone Dry." *Nursing Outlook*, July 1956, Vol. 4: No. 7, pp. 374-378.

A safe, effective, economical procedure for dry-sterilizing syringes and needles and for carrying them in public health nurses' bags is described in this article. The article also includes a list of equipment with costs and personnel required for this technic. The method of preparing syringes is based on the one currently used at the Clinical Center, National Institutes of Health, Bethesda, Md. The method of wrapping needles was originated by the authors and is described with illustrations.

Pendleton, Ruth, R.N. "Department Functions Smoothly Under System of Direct Responsibility to Administration." HOSPITAL TOPICS, September 1954, Vol. 32: pp. 77-79.

Surgery-central supply and the recovery rooms operate as one unit directly under the hospital administrator, rather than the nursing department, at the New England Deaconess, Hospital, Boston. The author tells, in detail, how the present arrangement was put into effect. After this organization was decided upon, the physical layout was designed for it.

Riley, William A. "Something New in Central Supply Layout." *Modern Hospital*, February 1954, Vol. 82: p. 79.

Isometric layout of the central supply department overcomes the hazard of cross-infection and provides for adequate supervision, says the author—an architect. A drawing is included showing the unit at the Burbank Hospital, Fitchburg, Mass. which serves approximately 400 beds.

Sanders, R. Douglas, M.D. and Aikins, James P., M.D. "Notes on the Characteristics, Composition and Care of Rubber Materials Used in Medical Goods." HOSPITAL TOPICS, March 1955, Vol. 33: p. 92.

The authors tell how intelligent care can greatly prolong the useful life of rubber materials. The general characteristics of rubber—neoprene and butadiene styrene—are given along with the points to be observed to obtain the maximum use.

Schafer, Margaret K. "Flask Technic for Sterile Surgical Fluids—a Guide for Planning." HOSPITAL TOPICS, May 1955, Vol. 33: pp. 85-86.

The author gives the recommended technic and the steps required to effectively introduce the use of hermetically packaged sterile distilled water or isotonic sodium chloride solution USP in hospital operating rooms, delivery rooms, and nursing units, instead of sterile water from water sterilizers.

Schafer, Margaret K. "Standardization in the Central Supply Department." HOSPITAL TOPICS, June 1955. Vol. 33: p. 95.

The steps to be taken by a central supply supervisor in developing a program of standardization are delineated in outline form. To achieve standardization there first must be a guide. Secondly, law and authority are necessary to enforce the rules. Thirdly, there must be acceptance of the program.

Schafer, Margaret K. "Planning a Central Supply to Meet the Needs of a Modern Hospital." *Hospitals*, June 1954, Part II, Vol. 28: pp. 417-420 (Administrators Guide Issue).

Detailed procedures are given by the author for setting up a CSR to meet the requirements for the modern hospital. Planning, equipment, organization, and operation of this department are of the utmost importance and will provide improved service and patient care.

Skolaut, Milton W., Scigliano, J. A., and Salvino, J.N. "The Central Sterile Supply of a Pharmacy Department." *Bulletin American Society of Hospital Pharmacists*, March-April 1954, Vol. 11: pp. 114-117.

"This Pharmacy Department Operates a Central Sterile Supply." HOSPITAL TOPICS, November 1954, Vol. 30: pp. 81-83.

Central sterile supply at the Clinical Center, National Institutes of Health, is a division of the pharmacy department. The subsections of the central supply division are outlined and described in these two articles. Pictures illustrate some of the work areas.

Skolaut, Milton J., and Salvino, J.N. "A Simple Method for Returning Used Needles." *Hospitals*, April 1955, Vol. 29: pp. 92-94.

A stainless steel pan lined with a cellulose sponge is furnished to all nursing units for the return of needles. This method aids in the processing of the needles, according to the authors.

Summers, Aubrey, R.N. "Pioneer Concept in Central Control." *Hospitals*, August 1954, Vol. 28: pp. 74-76.

This article on central supply service at the Bird S. Coler Memorial Hospital, Welfare Island, N. Y., describes: Master list of supplies, which is revised from time to time; use of requisition forms; checking for missing items; sterilization procedure; workload; maintenance technics, and the support needed for a smooth-functioning central supply.

Spencer, Paul J. and Coburn, Walter V. "Central Supply at the Crossroads." *Modern Hospital*, May 1954, Vol. 82: pp. 79-82.

The Lowell (Mass.) General Hospital, after two years of planning, decided to put the central supply department on the ground floor of its new building in a spot which was an equal distance to all units. Pictures of work areas and drawings of this central supply are included.

Terrell, Tol. "Pharmacy and Central Supply." *Texas Hospitals*, November 1954, Vol. 10; p. 7+.

This administrator believes that pharmacists are better adapted to central supply administration than any other group, because of the content of their college curriculum today. He tells how the pharmacy-central supply combination functions at Shannon West Texas Memorial Hospital, San Angelo.

Theresa, Sister M., OSF., R.N., M.T. "Hospital Pharmacy and Central Supply Combination." *Hospitals*, November 1955, Vol. 11; p. 7+.

"A Pharmacist Looks at a Central Service-Pharmacy Combination." *Hospital Management*, June 1955, Vol. 79: pp. 76-77.

In these two articles the author tells of her own survey, across the country, concerning this type of combined service. Because of the proximity of the pharmacy and central service in the smaller hospitals, she believes that a pharmacist is the ideal person to be in charge. Statistics show that this type of service is found in 21 percent of hospitals of less than 50 beds; 39 percent of hospitals of 50-99 beds; 79 percent of hospitals of 100-199 beds.

Ustas, Mathew, R.N. "Installing a CS Control System." HOSPITAL TOPICS, December 1954, Vol. 32: pp. 81-84.

A control system is necessary to central supply because it results in a standard for comparison and serves as a means of verification, the author points out. An example of a CSR daily count is included in this article.

"Alarm Guard Against Overflow." *Hospitals*, April 1956, Vol. 30: p. 28.

Described in this article is a simple device to warn personnel when a fluid-collecting bottle is almost full. A plastic bobbin, attached to metal rod, rides in the collecting bottle. The other end is attached to the alarm of an old clock.

"Autoclaving Tape." *Bulletin American Society of Hospital Pharmacists*, May-June 1954, Vol. 11: p. 209.

A method for sealing and identifying autoclaved bundles more easily, faster, and more efficiently with pressure-sensitive tape proved safe, this article states. Other advantages include: reduction of time and labor costs, neat, secure packs, ease of labeling, and convenience and safetty.

"Central Supply Room Aids Department Service at UCLA." HOSPITAL TOPICS, November 1955, Vol. 33: p. 93.

Regular meetings of the central supply department advisory committee promote interdepartmental understanding and better service to the hospital. Pictures illustrate this article.

"Central Supply Room—Alert Supervisor Improves Her Department." HOSPITAL TOPICS, January 1954, Vol. 32: p. 77.

Time-saving and efficiency-promoting measures at the Bishop Clarkson Memorial Hospital, Omaha, Nebr., developed by an alert central supply supervisor, are shown in this picture feature.

"CS at Cook County Hospital a Major Operation." HOSPITAL TOPICS, February 1955, Vol. 33: pp. 77-79.

Pictures illustrate a few of the work areas of the vast Cook County central supply service. This modernized central supply department services a 3,260-bed hospital.

"Central Supply Service Discussed at New England Meeting." HOSPITAL TOPICS, May 1954, Vol. 32: pp. 77-79.

Abstracts of lectures on central supply at the New England Hospital Assembly. Subjects discussed: training of personnel, relationship to administration, interdepartmental relationship, and financial implications.

"Sterile Tray Index Provides Checklist for Central Supply Room." HOSPITAL TOPICS, March 1954, Vol. 32: p. 67.

The booklet, Sterile Tray Index for Hospitals," written by Florence Donahue, R. N. and edited by Evelyn Roberts, R.N. contains 103 sterile setups for the average hospital, 10 of which are pictured with this article.

"U. of I. Hospitals Expand Central Supply." HOSPITAL TOPICS, June 1954, Vol. 32: p. 85.

Arrangement of rooms, installation of labor-saving devices, disposable packaging, and expansion of services and a rotating staff increased central supply service efficiency at the University of Illinois

INDEX

Accounting Systems 47-49
Administration 42, 43
Bibliography 97-106
Catheters, Sterilization of 76
Chemical Disinfection 72, 73, 75
Cultures 46, 77
Design 4-11
Dry Heat Sterilization 68, 78
Dust Collector 27
Economy 43, 90-93
Flow Process Charts
  Gloves 61, 63
  Needles 26
  Syringes 21
Flow Patterns 11
Gloves 27-29, 37, 53, 79
Infectious Hepatitis 79
Instruments, Sterilization of 78
Interdepartmental Relationships 43
Inventory, Control of 55
Labelling Supplies 15
Linen, Processing of 16-18
  Storage of 18
Management 38
Methods Engineering 4, 57
Needles 23-27
Oxygen Equipment 49
Oxygen Service 53
Paper Wrappers 76
Penrose Drains, Sterilization of 76
Personnel, Comfort of 6, 7, 11
  Training of 38, 41, 42, 44, 54
Planning 51, 90-93
Requisitions 40, 48, 54
Rubber Goods, Care of 82
Space Allocations 9-11
Stainless Steel in Design 8
Standardization of Supplies 94-96
Sterile Surgical Solutions 83, 84
Sterilization, Catheters 76
  Dry Goods 74, 75
  Gloves 79
  Sutures 76
  Syringes 67, 68
Sterilizer Controls 76, 77
Storage 12-15
Supervisor, Location of 4
Supplies, Economy of Use 68
  Prepackaging of 65-66
  Resterilization of 78
Sutures, Sterilization of 76
Syringes 19-22, 67, 68, 79
Terminal Sterilization 77, 78
Thermometers, Distribution of 71
  Marking of 68
Time Studies 9
Tray Set-Ups 52, 53
Tubercle Bacillus, Destruction of 77-80
Vaseline Gauze 75
Ventilation 15
Volunteer Help 44-46
Ward Standards 48
Work Load, Definition of 9
Work Simplification 30, 56-64
Work Stations 4, 11, 30
Work Tables, Sizes of 16-18
Wrappers 78

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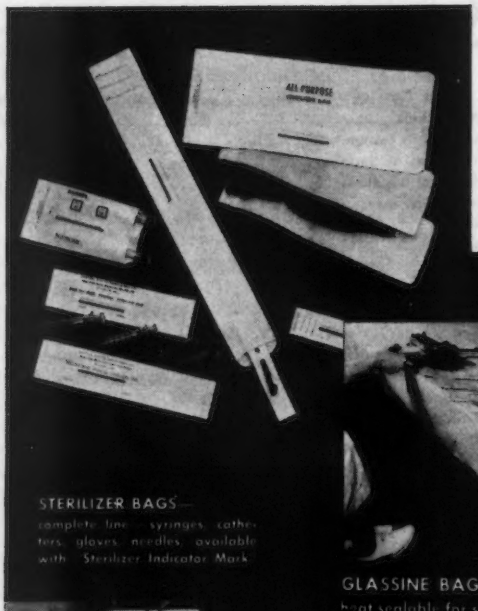

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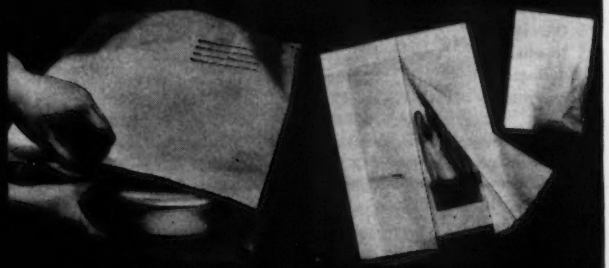

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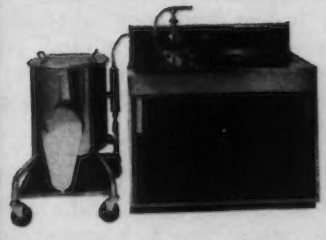

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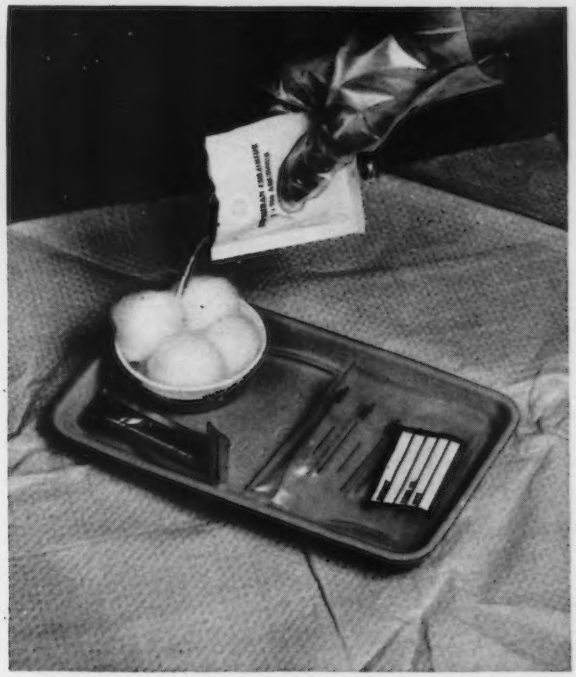

3 Tear open packet of Zephiran* (1/750) aqueous antiseptic solution, pour same over 5 large rayon balls in plastic coated cup.

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